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STUDY TO ANALYZE NEW CUMBERLAND ARMY DEPOT'S CONSOLIDATION AND --ETC(U)

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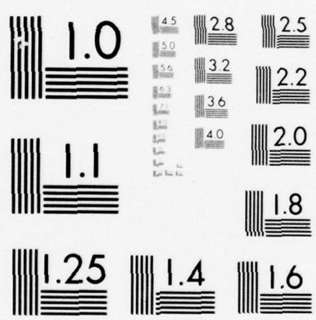

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STUDY TO ANALYZE NEW CUMBERLAND ARMY DEPOT'S
CONSOLIDATION AND CONTAINERIZATION POINT

Prepared by
Evaluation Research Corporation

17 April 1977

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This paper reports on a study to analyze operations of New Cumberland Army Depot's Consolidation and Containerization Point (CCP). The study considered various operational aspects of the CCP, namely; procedures, flow of information, and procedures,physical facilities and availability of ships and vans.A simulation model was used to establish optimum van loads. Recommendations for improving CCP operations, including improved van utilization are a part of the study.

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CONTENTS

ABSTRACT

The ability of the Containerization and Consolidation Point (CCP) to derive optimum van utilization is influenced by a number of factors. They are: availability of material, operating procedures, timeliness and accuracy of information provided the load planners, physical facilities, ship sailing dates and constraints placed on the CCP by Direct Support System Performance requirements.

The study addressed the question "How to improve van utilization within stated DSS requirements?" Each of the major areas were investigated by study team members resulting in recommendations for improving the CCP operation. The classical operations research approach was followed to identify and bound the problem, observe and collect data, analyze the data, evaluate the results and make appropriate recommendations.

Study results indicated the need for improving physical facilities in the surface storage section of Building 83. Improvement in the accuracy and timeliness of computer prepared loading facsimile was also deemed necessary. A model was developed to simulate loading vans. Model results indicate that better loads can be built without an increase in hold time.

SUMMARY

PROBLEM

A reduction in the number of sailings to Europe created an adverse effect on CCP operations. Multiple partial shipments to the same customer aboard the same vessel became more frequent. Also, van utilization remained below stated goals.

Evaluation Research Corporation (ERC) was hired to conduct a study to analyze New Cumberland Army Depot (NCAD) Consolidation and Containerization Point (CCP) and recommend ways to improve its operation.

BACKGROUND

The Direct Support System (DSS) was implemented in 1970 in US Army Europe (USAREUR). Since that time it has been implemented worldwide. One of the fundamental concepts was the establishment of a Consolidated and Containerization Point. The New Cumberland Army Depot, New Cumberland, Pennsylvania CCP was established to receive, consolidate, containerize and ship DSS material direct to USAREUR.

Until 1975 there was a sailing to Europe virtually every day thereby negating the requirement for loading vans based on a specific sailing date. Currently, however, sailings are less numerous which impact on van utilization and the use of existing facilities.

With fewer sailings one would expect to see an increase in van utilization, a larger number of shipments direct to the customer, and possibly an increase in CCP hold time. Paradoxically, partial van loads are being shipped to the same customer on board the same vessel, while van utilization is below the standard set by CCP supervisors.

To assist the loader a computerized system was developed to report the volume of material available to him for shipment. The data reported includes consignee, volume, TCN, number of days in the CCP, etc. The

system as operated, lacks timeliness and contains sufficient errors to dilute its credibility.

As part of a contract to determine ways to improve van utilization, a study of the CCP's operation was undertaken. The study encompassed the following areas: operating procedures, physical facilities, information requirements and processing and material storage. The study was restricted to surface material operations.

APPROACH

The study followed the accepted operations research approach to solving problems. It included: defining the problem, placing boundaries on the problem, defining the approach, establishing data requirements, collecting and analyzing data, evaluating the results and making specific recommendations.

Study team members visited NCAD frequently to discuss various aspects of the study, to collect data and observe the CCP operation. Discussions were held with all levels of CCP managers and employees and with other personnel that impact CCP performance, e.g., computer and industrial engineering personnel.

Data representative of all CCP operations were collected, processed and analyzed. These included: operating procedures, facsimiles, manifests, ship sailing dates, consignee/route assignments, computer capabilities, physical facilities and van utilization.

Results of the analyses were evaluated and recommendations for improving overall CCP performances were made.

RECOMMENDATIONS

1. Procedures generally were adequate for use by experienced personnel; however, they should be improved if they are to be used to instruct new personnel. It is recommended that more detailed procedures be written for movement of surface material, shipping hazardous material, information flow, and safety.

2. Three programs to improve computer services to the CCP are under consideration or in progress. One would increase the capability of the

existing SPEEDEX Computer, another would provide the CCP with a test mini-computer as part of a larger project, the third would increase the capability of the existing sortation computer as part of the planned expanded sortation system.

ERC recommends that the CCP continue to investigate the expansion of the sortation computer's capability until such time that one of the above programs actually becomes operational. This will provide the CCP with an alternative approach to solving the computer problem that is degrading CCP performance if there is a significant delay in the other programs.

3. Physical facilities for loading surface material are somewhat inadequate and should be improved. It is recommended that high intensity lights, similar to those in the air material area, be installed in the surface loading area. Further, ERC recommends that the plan-o-graph in Chapter 4 of the report be implemented.

4. It is anticipated that van utilization will increase if all of the recommendations are implemented. There is, however, yet another recommendation that will increase reported performance; taking full credit for those vans that weigh out before they are full. The model developed for this study was designed to consider both weight and volume. Results for the Brown Route show that several vans weighed out before they were full increasing the utilization of vans. ERC recommends that computer programs be revised to accept 100% of volume for those vans that weigh out before they are full.

5. Model results indicate that material can be held for longer periods of time to achieve the goal of increasing van utilizations without a significant increase in hold time. Loaders must be willing to accept this fact. ERC recommends that material be held longer (particularly for large volume routes) for use in building better van loads.

Chapter 1

INTRODUCTION

BACKGROUND

The Direct Support System (DSS) was implemented in 1970 in US Army Europe (USAREUR). Since that time it has been implemented worldwide. One of the fundamental concepts was the establishment of a Consolidated and Containerization Point (CCP). The New Cumberland Army Depot (NCAD), New Cumberland, Pennsylvania CCP was established to receive, consolidate, containerize and ship DSS material directly to USAREUR.

Material requisitioned by USAREUR units is received from Army, Defense Logistics Agency (DLA), General Services Administration (GSA) and other suppliers. Consolidated air shipments are trucked to Dover AFB, Dover, Delaware and surface shipments are trucked to the appropriate Port of Embarkation (POE) for ultimate delivery to the requisitioner. Material destined for surface shipment to USAREUR is loaded into vans while air shipments are loaded onto 463L pallets.

PROBLEM

Until 1975 there was a sailing to Europe virtually every day, thereby negating the requirement for loading vans based on a specific sailing date. Currently, however, sailings are less numerous which impact on van utilization and the use of existing facilities.

With fewer sailings one would expect to see an increase in van utilization, a larger number of shipments direct to the customer, and possibly an increase in CCP hold time. Paradoxically, partial van loads are being shipped to the same customer on board the same vessel, while van utilization is below the objective set by CCP supervisors.

The load planner must consider many variables and constraints while attempting to maximize van utilization. He, therefore, must be highly

motivated, dedicated and experienced. Examples of the areas to be considered before he releases material for shipment are:

- Operating procedures
- Volume/Weight of material available
- Configuration and fragility of material
- Hold time
- Sailing date
- Number and size of vans in pool
- Number of vans contracted for each sailing
- Availability of floor space
- Employee scheduling (keeping employees occupied)

The load planner must be provided information relating to each item if he is to build acceptable van loads. Procedures, facilities and information such as hold time, material available, sailing date, size and number of vans available, and the number of vans contracted for shipping are provided by various means. All of the above affects the loader's decision. Additionally, he must visually inspect each pallet to determine if it contains fragile material and/or its configuration will allow stacking other material on top of it.

In order to provide the load planner with as much information as possible regarding the material available for shipment, a facsimile load plan is produced from data stored in the SPEEDEX computer. The planner can accept, reject and/or add material to build the load by the use of specific data codes. Following data input and processing, a manifest is produced and the material is loaded into the van. Facsimiles produced generally are untimely due to lack of processing time on the SPEEDEX computer. The facsimiles also contain erroneous data due to key punching and other factors.

APPROACH

The study was designed to address all of the above items except those areas that were a direct infringement on management perogative, i.e., use of employees, number of vans contacted for sailings, etc.

The study followed the accepted operations research approach to solving problems. It includes: defining the problem, placing appropriate boundaries

around the problem, defining the approach, establishing data requirements, collecting and analyzing the data, evaluating the results and making specific recommendations.

Study team members visited NCAD frequently to discuss various aspects of the study, to collect data and observe the CCP operation. Discussions were held with all levels of CCP managers and employees and with other personnel that impact CCP performance, e.g., computer and industrial engineering personnel.

Data representative of all CCP operations were collected, processed and analyzed. These included: operating procedures, facsimiles, manifests, ship sailing dates, consignee/route assignments, computer capabilities, physical facilities and van utilization.

Results of the analyses were evaluated and recommendations for improving overall CCP performances were made.

SCOPE

The study was limited to those CCP operations that affected van utilization and performance. The study did not consider personnel grade structure, numbers, capabilities and work schedules, the sortation system and transportation. However, when these areas affected CCP performance, an attempt was made to derive an estimate of the effect.

DATA DESCRIPTION

Data were collected for each study segment. Data describing the physical facilities were collected. It included available floor space for the plan-o-graph, estimating the amount of light in footcandles for each bay in Building 83 and availability of van loading space.

Operating procedures were obtained and studied to determine their applicability and effectiveness.

Facsimiles and manifests were obtained and studied. Study members followed the facsimile/manifest process on site for seven working days.

Material receipt and shipment data were obtained for use in laying out the plan-o-graph, estimating CCP van utilization and input to the simulation model. Volume shipped to each consignee and route were also used to develop the plan-o-graph and as input to the model.

Chapter 2

PROCEDURES

BACKGROUND

An initial step in the study to improve container utilization at NCAD was to document the procedures and documentation flow associated with processing material through the CCP. It was necessary to understand not only what was described in the NCAD Director of Supply Regulation 740-1, but how the process was actually being performed and the extent to which the documentation needed to be changed to reflect actual or desired procedures. These then could be related to the results of other analyses to provide a comprehensive picture of present operations. This, in turn, provides a baseline for recommended improvements.

APPROACH

The approach used was to develop draft flow diagrams reflecting the procedures as stated in Reg 740-1. These drafts were then reviewed with the using personnel along with direct observation of warehouse and documentation operations. The drafts were revised and annotated accordingly to reflect a clear portrayal of actual operations. Appropriate notations were made to identify procedures missing or not clearly defined in the Reg 740-1 and variances between actual and described procedures.

RESULTS

Flow diagrams for the following operations are presented in Appendix A.

	Procedure	NCAD DIR/SUP REG 740-1 Reference Procedure
5-1	Induction of Parcel Post	5
6-1A	Standard Cargo Freight Receipts Depots, DSA, GSA	6
6-1B	Hazardous Cargo & High Priority Freight Receipts, Depots, DSA, GSA	6
6-1C	Bulk Parcel Post Freight Receipts Procurement Material	6
6-2A	Standard Freight Receipts Procurement Material	6

6-2B	Hazardous, High Priority and Divert Freight Receipts Procurement Material	6
7-1	NCAD Generated Cargo	7
8-1	Unloading Work Order Control Processing	8
9-1	Preservation, Packaging, Packing, Mailing Work Order Processing	9
10-1	Outloading 463-L Air Force Pallets	10
11-1	Outloading SEAVANS	11

Procedures 12 Diverted Shipments and 13 Cancellation and Frustration of shipments were not flow diagrammed.

The procedures in the 740-1 were found to be reasonably complex and not readily translatable into simple diagrams. A number of the procedures needed to be supplemented and modified to reflect actual operations.

Although detailed specifications are available for the CCP/SPEEDEX data system, there is a need for a comprehensive description of overall CCP operations and the associated documentation/data system. This is considered essential for management visibility, operations analysis, establishing priorities and other decisions related to overall CCP performance.

RECOMMENDATIONS

Rewrite and reorganize NCAD DIR/SUP REG 740-1 into a two level document. The top level would provide management and supervision with a clear picture of CCP operations with associated material and documentation flow. The second level would be a "family" of procedures defining each major operation and its documentation/data requirements. The second level would be written for and directed to the operating personnel.

The recommended procedures would be organized essentially as follows:

<u>Level One</u>

Present scope, purpose, policies, responsbilities, and an overview of CCP processing and documentation. Emphasis should be placed on a clear portrayal of CCP operations, the functions to be performed, data and its relationship to the material, and the applicable planning and control procedures. The level one procedure would also define and illustrate data forms common to more than one functional area along with an explanation of the data purpose, processing and reporting.

Level Two

Detailed, stand alone procedures for each operation. These procedures should be written to an "application" level and be suitable for use in personnel training and day-to-day operations. The procedures should contain the applicable documentation forms with illustrations of their use. The level two procedures should be reviewed frequently (quarterly or semi-annually) for conformance to actual operations, and potential improvements.

LEVEL ONE DOCUMENT

DIR/SUP Regulation 740-1

NCAD Consolidation Containerization Point
(CCP) Operations

General

- Scope
- Purpose
- Policies
- Responsibilities

Operations

- Receiving
- Material Handling
- Palletization and Packaging
- Load Planning
- ALOC
- Van Loading

Documentation

- Procedures and Forms
- Data Handling and Processing
- Reporting

LEVEL TWO DOCUMENT

(Typical)

DIR/SUP Regulation 740-1

Detail Specification - Induction of Parcel Post

General

- Description of Operation
- Responsibilities
- Relation to other CCP Operations

Operating Procedures

- Receipt
- Material Check
- Sortation Operation
- Mobile Parking Station Operation
- Marking and Strapping Operation

Documentation Procedure

- Description and Function
- Document Preparation
- Document Flow
- Processing and Reports

Chapter 3

STUDY OF FACSIMILES

BACKGROUND

CCP loaders are provided a facsimile of potential loads by the SPEEDEX computer. The facsimile attempts to portray to the loader what is available for shipment. The loader uses the facsimile to build his load, however, he must make certain that the material is actually on the floor and available for shipment. Erroneous information creates additional problems for the loader because he must check-out the facsimile for the same item until it is purged from the facsimile. The SAG instructed study members to investigate the facsimiles situation and make recommendations for solving the problem.

PROBLEM

Early to the CCP revealed that a potential problem existed in the facsimile area. The facsimile is a document produced by the SPEEDEX computer from data input from the CCP receiving and shipping sections, that identifies material available for shipment on the floor by consignee. It provides the CCP loader with simulated van loads by consignee within cluster. The loader then builds his load using material as it is portrayed on the facsimiles and other material that is on the floor but does not appear on the facsimile. Procedures are available to the loader for accepting, rejecting, or adding material to the proposed facsimile in order to manifest the load.

The ideal situation is one that provides the loader with a facsimile that actually describes what is on the floor. However, this probably requires a near realtime information system. The current system utilizes the NCAD SPEEDEX computer that is also required to process MRO's and many other data files. Because it was assigned a lower priority, the CCP receives less than adequate service. Delays in producing the facsimile and incorrect input data results in reporting erroneous information to the loader.

Following considerable discussion, the SAG instructed ERC to investigate this problem area.

APPROACH

The procedure approved by the SAG shown below, was followed during the facsimile investigation.

1. Select cluster
2. Purify data in file
3. Track facsimiles
4. Evaluate results

Objectives of the investigation were discussed with CCP personnel. Following some discussion, the group concluded that the Yellow Route would be used in the test vehicle.

Data on the initial facsimiles reviewed were compared with material actually on the floor to establish a baseline accuracy figure. Results of this endeavor reduced the number of apparent erroneous items (items on the floor and not on facsimile and vice versa) on the facsimile to 7. Ideally, all receipt data would be withheld from the computer until all facsimile errors were corrected. However, at the request of CCP personnel, receipt data was not withheld until an error free facsimile was obtained; rather, a business as usual policy was maintained. This required beginning the test with facsimiles that carried erroneous data; however, in order to meet the requirement for an error free facsimile, new TX4's were tracked as they appeared in the system.

RESULTS

Facsimiles were tracked for a period of 7 days. At the end of the 7th day, erroneous entries increased from 7 to 28, an increase of 21 or 3 errors per day. Causes of the increase included erroneous TCN's duplicate entries, and entries out of sequence.

Erroneous TCN's included some that were obviously incorrect such as WK5XXX and WK?XXX. A dump of shipment data for a two month period also included these types of errors:

- Duplicate TX4's
- Incorrect TCN's
- Missing TX4's and BBC's
- Appearance of TX4's on facsimile with no material on the floor including
- Appearance of TX4's after a load was manifested

For unknown reasons some of the errors bypassed the checks written in the validation program.

During this period, for example, items appeared on a facsimile after they were manifested and shipped. Causes of their appearance were not determined; however, it is suspected that TX4 data were submitted twice, although upon questioning loaders, none would admit to doing it. This situation can result when a TX4 is input to the computer after the wrap-up cycle. It therefore will not appear on the next facsimile. Then, if during this period, a loader prepares a TX4 for shipment and the computer manifests the shipment, one TX4 will be deleted from the file because it was manifested; however, the other TX4 will remain in the file.

Table 3-1 depicts sample listing from five consecutive facsimiles for consignee WK4FUU. Item 1 shows that each of the five facsimiles reported the same material available for shipment. This entry included erroneous date, i.e., a check by study personnel revealed that the material was not on the floor. Under present procedures this item will be carried in the file and will appear on all subsequent facsimiles until it is deleted during a computer purge run. Item 2 shows a correct entry. The item appeared on the facsimile the first day it was manifested and shipped the next day, and was deleted from the file. Item 3, however, shows that the item was manifested and shipped on the first day but was not deleted from the file. This situation was probably caused by duplicate entries discussed above. Item 4 shows another correct entry.

Table 3-1

SAMPLE DATA FROM FIVE CONSECUTIVE FACSIMILES
FOR YELLOW ROUTE ACTIVITY WK4FUU

	Facsimile Number				
Item	GS-316	L3-317	IT-320	6U-321	CS-322
1	Line 20	Line 36	Line 68	Line 71	Line 54
2			Line 71	Line 74 TX4/Man	
3	TX4/Man	Line 40	Line 82	Line 81	Line 66
4	Line 16 TX4/Man				

Currently the file is purged of erroneous data monthly or when requested. This time lag permits a build-up of erroneous data that detracts from the facsimile's credibility.

Interrogation of loaders and discussions with CCP personnel revealed that each loader has his own reasons for liking or disliking the facsimile. The important questions to be answered are "Does he use the facsimile?" If so, how? Based on the observations of study member, there is no definitive pattern except, the day shift used the facsimiles to better advantage than the night shift. The reason for this phenomenom could not be determined. It is possible that the presence of "brass" on the day shift may have influenced the loaders. The consensus of loaders polled is that the facsimile could be more timely. This would more accurately reflect what is on the floor.

A good fascimile provides the loader with sufficient information to plan acceptable van loads. Therefore, it behooves the CCP to provide him with the best possible facsimile. Several approaches aimed at improving the current facsimile process were presented to the SAG. Of the four basic alternatives designed to assist the surface material loader, the SAG instructed ERC to pursue the one that includes upgrading the sortation computer located in the CCP. An upgraded sortation computer would have the capability to continue to operate the sortation system and in addition, provide the CCP with near real-time facsimiles for use by material loaders. It is assumed that correct facsimiles provided in a timely manner would result in improved van utilization.

PROPOSED SOLUTION

There are two criteria that a best possible facsimile must meet - accuracy and timeliness. The facsimile must accurately portray what is available on the floor for shipment, including those items that must be shipped to meet DSS standards and/or customer Required Delivery Dates (RDD). The facsimile, also, must be timely to insure that all material available for shipment is actually on the facsimile to solve the problem of duplicate entries. One solution to both problems is to put facsimile production on a real or near real time basis. As material is moved from the receiving area to the loading bays, TX4 and other data should be input to the computer (if, with proper coding, it can be accomplished prior to moving the material to the

loading area that would further increase the facsimile's usefulness). The loader will be able to build better loads if he is made aware of all the material available for a consignee or cluster.

APPROACH TO SOLVING THE PROBLEM

The approach that ERC followed, as approved by the SAG, was a straight forward systems analysis procedural approach. It included defining the problem, identifying and enumerating all possible constraints in order to properly bound the problem, estimating the workload and requirements for system hardware and software.

Several constraints were placed on ERC by the SAG. The proposed system should:

- Not interrupt sortation system operation
- Not include anticipated increase in sortation system workload
- Not include ALOC
- Consider the effect of dual processing by SPEEDEX computer and the LSSA Architectural Plan.

Production of real time facsimiles/manifests using the present hardware configuration and operating system is virtually impossible for the following reasons:

1. Most of the available core is required for the sortation software.
2. 90% of the program disk capacity is used.
3. The present operating system is operated as a single partition system. A two-partition operating system implies a requirement for more core as well as acquisition of the software to drive it.

The present sortation system is designed for 200-250 units. This is scheduled to be increased to 500 units. The increase will require additional programming and modifications. An increase in computer storage capacity will also be required. As stated previously, the SAG, however, instructed ERC to ignore the proposed increase in their investigation, however, it must be considered in the overall scheme.

As another constraint, ALOC was to be excluded from the study. Current ALOC procedures follow accepted air shipment procedures that input TX4 and associated data for manifesting a shipment without producing a facsimile.

For this part of the study, ALOC manifests would continue to be produced on the SPEEDEX computer.

There are two programs that could impact on the facsimile problem; one is a local program that will utilize a dual processing function designed to provide more computer time for low priority processing, the other program (Architectural Plan) is being designed and implemented by LSSA. The present computer processing capability will be divided into two parts, one for supply depot processing, the second for other processing, i.e., CCP, finance, personnel, etc. Although this should provide additional time for other data processing, CCP requirements cannot be accommodated.

The LSSA program is designed to provide each functional user with a mini-computer for local processing and subsequently input the data into other minis for additional processing and subsequent storage in the 3300. While this complex system can provide the CCP with its own data processing capability, it is still approximately 3 years from implementation. There is however, one part of the system scheduled for implementation in July that may provide some relief. Mini-computers will be used to share the 3300 computer work load by doing some of the back-end processing and computer assignments. If this is actually accomplished, additional 3300 time may be available for CCP processing. A part of this effort will be tested at NCAD/CCP in the near future, i.e., a mini is scheduled for installation at the CCP. Before this becomes a reality, software programs must be written, tested, and debugged. However, because there can be lengthy delays, the CCP should continue its investigation into expanding the sortation computer.

WORKLOAD

Discussions with CCP personnel and observations made by study personnel indicate that the expected surface data workload can be readily processed by a larger sortation computer.

The estimated workload for surface material includes 7-9000 cards/day, production of 40-50 facsimiles/day, 20-25 manifests/day, periodically dumping processed data into the SPEEDEX computer will continue to process all CCP data for transmission to LCA and MTMC and continue preparing those reports that are currently produced.

The system under consideration will include a continuous file update feature that will permit real time facsimile preparation. This feature can be further enhanced with advance notice of material enroute or, as a minimum, NCAD shipments to the CCP. Advance notice of shipments will provide the loader with the opportunity to build better loads by waiting for material enroute to the CCP.

Hardware Requirements

The existing system utilizes a Hewlett-Packard HP-2100A computer with ancillary hardware shown in Table 3-2. Additional hardware requirements are also shown in the table.

In addition to the existing hardware the system employed one computer operator and one-half of a programmer. It is anticipated that the expanded system can be operated with the same personnel.

Table 3-2

A COMPARISON OF THE EXISTING SYSTEM
VERSUS MINIMAL UPGRADING AND IDEAL UPGRADING

System Units	Existing Capacity	Upgraded Capacity	Ideal Capacity
Central Processor	32K Bytes	64K Bytes	96K Bytes
Disk	5M Bytes	20M Bytes	20M Bytes
	2.5 Fixed/2.5 Remove	7.5/12.5	
Card reader	Minimal Usage	Employ Fully	Replaced by CRT
Printer	180 CPS	180 CPS	180 CPS
Teletype	10 CPS	10 CPS	10 CPS
Operating System	1 Partition	2 Partitions	3 Partitions
CRT/Keyboard/ Cassette	Not Available	1 Unit	2 Units
Interface with 3300	Not Available	Possible	Necessary

Software

The major difference between the upgraded systems of Table 3-2 is in the capability to perform the functions listed in Table 3-3 below. Since the operation of the sortation equipment is a constant requirement, the undertaking of all other tasks would have to be accomplished within the remaining partition. In the "ideal" system configuration, all functions could be accomplished comfortably and the card punching operation eliminated in favor of CRT entry of data.

A list of computer programs that will be required to process CCP data and produce facsimiles and manifests is shown in the table below.

Table 3-3

SOFTWARE REQUIREMENT FOR CCP DATA PROCESSING

- Input data/validation
- Sort routines (consignee, cluster, date, etc.)
- Facsimile processing
- Facsimiles printing
- Loader input/validation
- Facsimile update
- Manifest preparation
- Manifest printing
- Housekeeping programs
  - File update
  - sort routines
  - preparation and submission of data to SPEED-X computer
- Other

Cost

The estimated costs for additional hardware to prepare facsimiles and manifests for the expanded system and on a real time basis is $25,000.00 for the ideal system. Estimated cost for preparing software for the above stated requirements is approximately $35,000.00 for both systems.

Recommendations

The computer situation at NCAD (including the sortation computer) is in a state of flux. Several programs are in progress that could provide a solution to the CCP computer availability problem. Although they were previously discussed, they will be presented again:

1. Enhancing the sortation computer capabilities as part of the overall sortation expansion program
2. LSSA architecture program
3. SPEEDEX computer enhancement program
4. Minicomputer test

There are several recommendations that should be apparent to the reader. However, ERC firmly believes that one alternative stands out if improving CCP performance is of paramount interest to NCAD.

ERC recommends that NCAD initiate a program to replace the present sortation computer with the ideal system described on page 3-7 for the following reasons:

- The system proposed is capable of programming both CCP and sortation information simultaneously
- The system is expandable if necessary. This will take care of wartime requirements.
- The proposed minicomputer test, a part of the LSSA system architecture program, although scheduled for this summer, can be delayed. Also, this adds a second computer to the CCP operation when one can handle all of the CCP and sortation system requirements.

Chapter 4

PHYSICAL FACILITIES

BACKGROUND

The CCP is located in Building 83 of the New Cumberland Army Depot. CCP offices are also located in that building. There are approximately 400,000 sq. ft. of space in the building. Fire walls divide the total space into 5 equal areas of approximately 80,000 sq. ft. each.

The surface material loading area is confined to Bays 3 and 4. Neither area is completely reserved for loading surface shipments. A cafeteria and office is planned for Bay 3. A portion of Bay 4 will be used to extend the present sortation system.

Surface material is received in Bay and stored for shipment in Bays 3 and 4. The area is divided into smaller segments that are designated as storage areas by route. Space allocations are based on volume of material received/shipped and are identified by floor and hanging markers. The spaces are laid out to simulate the floor of a van, i.e., 8' x 40'. Additional 8' x 40' spaces are allocated to larger consignees. This provides the loader with the opportunity to make a reasonable estimate of the material available for shipment for a given route.

Standard lights are placed overhead and in the surface material storage area. Lights in the other areas, however, are of the newer high intensity type that provide more candlepower.

PROBLEM

Physical facilities affect the overall operations of the CCP. Inadequate lighting can create problems in reading and recording data, lack of storage space can force shipment of material out of sequence, poor route identification and boundary markers can result in placing material in the wrong route location.

A sufficient amount of data is read and recorded, additionally, there is considerable movement of material within the surface material storage area to warrant adequate lighting. MILSTRIP documents (DD Form-1348), in some instances the flimsy copy, must be read to determine

consignee in order to store material within the proper route location. Loaders prepare facsimile change cards after checking for material and other pertinent documentation for input to the computer. A well lighted area should result in fewer input data errors and misplaced material.

Material is being shipped out of sequence, i.e., hold time is extended for material stored in the rear of the storage area because material is usually loaded from front to back. Another problem is allocation of floor space. How much floor space should be allocated to each route and where should the route be located to facilitate van loading is to be considered.

Easily visible route boundaries are also necessary to reduce the number of misplaced shipments.

APPROACH

Two basic approaches were followed; (1) measure the amount of light (in foot candles) to estimate its adequacy and (2) prepare a plan-o-graph that would incorporate additional storage within the space allocated. Each is discussed in more detail later in the report.

PLAN-O-GRAPH

Background

The plan-o-graph was developed as approved by the SAG. Discussions regarding floor space allocation were held with CCP personnel to capitalize on their experience in storage facilities operations.

The approach is designed to develop a plan for storing material for shipment in order to provide the forklift operator, loader, and supervisor with better storage and loading facilities. The plan includes a new plan-o-graph with racks that can be used for storage as well as identifying clusters and consignees, etc.

The plan-o-graph establishes a clearly marked, easily visible and well defined cluster area. For example, storage racks are placed at the end of each cluster to identify cluster boundaries; consignee identification can also be placed on the appropriate rack. Within each area, floor space is reserved for overflow and outsized material. Material for large volume consignees will be stored on the floor within cluster

boundaries. For small volumes consignees material can be stored under and on the storage racks. This method keeps material for one cluster confined to an area readily visible to the loader permitting him to quickly make a determination when to load a van. This will also provide him with ample space to hang signs, instruction, etc., so that he can work more efficiently and effectively. Supervisors can also be more effective in discharging their duties. The expected decrease in surface material shipments due to ALOC should make this proposed plan even more effective.

Preparation of Plan-o-graph

Preparation of the plan-o-graph for the surface material loading warehouse followed accepted procedures. The initial plan-o-graph was developed based on the availability of two full bays for surface material. Since that time 20,000 sq. ft. of Bay 4, previously assigned to surface loading, was reassigned to the ALOC test and an additional 2800 sq. ft. was allocated for office and cafeteria space, leaving a total of approximately 57,200 sq. ft. of floor space to be allocated.

The concept was presented at the 14 January 1977 meeting of the SAG, for approval which was granted. Data for the period 76211 through 76274 were used to estimate daily average cu. ft. of material received by consignee within cluster for air and surface shipments. ALOC data were used to estimate its effect on surface shipments.

The above procedures were used to prepare two plan-o-graphs, one using racks to identify cluster boundaries; the other using racks to provide major divisions of each bay with cluster boundaries identified by floor markers. The latter plan-o-graph would use the racks for storing material for small volume customers.

Data for preparing the plan-o-graph for the surface material loading area followed the outline below:

1. Obtain warehouse dimensions
2. Estimate average daily cubic feet of air and surface material received by unit within each cluster
3. Estimate volume currently shipped by surface transportation that will be shipped by air for ALOC units

4. Subtract Item 3 from Item 2

5. Prepare plan-o-graph

Part of surface loading area was reassigned to the ALOC test and an additional 2800 sq. ft. was allocated for office and cafeteria space, leaving a total of approximately 57,200 sq. ft. of floor space to be allocated.

RESULTS

Table 4-1 shows the volume of material received by route at the CCP prior to ALOC. The volume received as recorded on the TX4 data card, was used in this estimation.

The data in Table 1 include ALOC units. Note that the percent of material shipped by air is significant in some clusters and rather insignificant in others. Each cluster was evaluated using not only these data but data from ALOC test reports.

Recognizing that the date recorded on the TX4 could represent only one of several receipt dates, study members checked these results with those recorded by the ALOC study group in its report titled "ALOC Implementation Plan." Table 4-2 shows the percent of material shipped to Brown Route Consignees participating in both studies. WK4GA3, over a ten month period utilized in the ALOC study report, received 56% of all material received by ALOC units within the Brown Route. The two month period used in ERC's calculations showed the same unit received 64%, an increase of 8 percentage points, well within the acceptable range desired for computing consignee floor space. Although the two month period compared favorably with the ALOC study, there was some concern regarding the possibility of variation in data sources. Therefore, a comparison was made between the two month period and a 7 month period using data derived from CCP monthly/quarterly reports. Results of this comparison are shown in Table 4-3. The figure shows that there is virtually no difference in the two periods.

Table 4-4 shows the volume of material shipped by air and surface to each route during the month of January 1977, the first full month of

Table 4-1

VOLUME OF MATERIAL RECEIVED BY ROUTE
SURFACE VS AIR (PRE-ALOC)
AUGUST 1, 1976 - SEPTEMBER 30, 1976

	Volume				
Route	Surface	Air	Total	% Surface	% Air
Green A	171,068	6,549	177,617	96.3	3.7
Red B	125,488	10,911	136,399	92.0	8.0
Purple	59,403	2,647	62,050	95.7	4.3
Green B	85,581	18,199	103,780	82.5	17.5
Yellow	57,948	12,015	69,963	82.8	17.2
Isolated A	53,914	2,205	56,119	96.1	3.9
Isolated B	30,612	714	31,326	97.7	2.3
Blue	138,276	10,417	148,693	93.0	7.0
Orange	169,170	11,777	180,947	93.5	6.5
Red A	73,764	7,821	81,585	90.4	9.6
Brown	294,557	17,262	311,819	94.5	5.5
Isolated C	98	1,913	2,011	4.9	95.1
Isolated D					
Unknown	33,290	625	33,915	98.2	1.8
TOTAL	1,293,169	103,055	1,396,224	92.6	7.4

Table 4-2

COMPARISON OF BROWN ROUTE ALOC CONSIGNEES
Percent of Total ALOC Study - August-September 1976

	Percent of Total	
	ALOC Study Dec 74 - Oct 75 Less July	ERC Study Aug - Sept 1976
DSU (Brown Route)		
WK4FW2	3	Neg
WK4F30	5	2
WK4F88	Neg	Neg
WK4GA3	56	64
WK4GBY	21	16
WK4GBZ	7	16
WK4GCB	3	Neg
WK4GB8	Neg	2
WK4GA5		
WK46B6		

Table 4-3

MATERIAL RECEIVED BY ROUTE
Comparison of Two Data Periods

	Percent of Total (Surface Only)	
Route	Aug/Sept	7 mos.
Green A	13.2	14.6
Red B	9.7	9.3
Purple	4.6	4.7
Green B	6.6	7.2
Yellow	4.8	5.3
Isolated A	4.2	4.1
Isolated B	2.4	2.0
Blue	10.6	8.5
Orange	13.1	14.3
Red A	5.7	4.6
Brown	22.5	20.3
Isolated C	neg.	neg.
Isolated D	neg.	1.3
Unknown	2.6	3.8
	100.0	100.0

Table 4-4

VOLUME OF MATERIAL BY ROUTE
SURFACE VS AIR (ALOC)
JANUARY 1977

	Volume				
Route	Surface	Air	Total	% Surface	% Air
Green A	124,539	40,899	165,438	75.3	24.7
Red B	95,307	35,788	131,095	72.7	27.3
Purple	52,329	8,446	60,775	86.1	13.9
Green B	44,741	51,952	96,693	46.3	53.7
Yellow	44,159	20,086	64,245	68.7	31.3
Isolated A	21,313	28,358	49,671	42.9	57.1
Isolated B	30,612	714	31,326	97.7	2.3
Blue	95,927	31,831	127,758	75.1	24.9
Orange	149,471	27,278	176,749	84.6	15.4
Red A	47,341	24,404	71,745	66.0	34.0
Brown	258,694	36,082	294,776	87.8	12.2
Isolated C	120	2,792	2,912	4.1	95.9
Isolated D					
Unknown	33,290	625	33,915	98.2	1.8
TOTAL	997,843	309,255	1,307,098	76.3	23.7

the ALOC test. Comparing percent surface in Tables 4-3 and 4-4 reveals that considerable differences are noted.

Table 4-5 shows the estimated volume of material that will be shipped to each route after adjustments for ALOC. Again, significant differences are noted. These differences were considered in allocating floor space to each route.

Estimating the floor space requirement for each consignee followed the procedure used for the routes/clusters. ALOC data were used in conjunction with pre-ALOC information to allocate floor space to each consignee. Table 4-6 shows the adjusted volume derived for the Brown Route consignees. As with cluster volume, ALOC also has a significant effect on consignee surface volume/shipments.

Adjusted volume for each consignee is shown in Appendix B.

Low Volume Units

An analysis was performed to determine the effect of low volume units on surface and ALOC shipments. Units that received less than 250 cu. ft. by surface means in each of seven months were identified and included in the ALOC segment of the analysis. A total of 33 units were identified. Their impact on surface and air shipments were negligible, because they accounted for less than 1% of the surface volume shipped. Similar results were noted when they were included in the ALOC segment.

Detailed results of the analysis are presented in Appendix C.

Allocation of Floor Space

Floor space was allocated using the percent of total surface volume (less ALOC) received for the period as the primary consideration. The number of consignees in the route was also considered to insure a sufficient number of storage locations. Results presented were approved by CCP personnel following considerable discussion.

Table 4-7 shows the percent of total volume received as adjusted for ALOC, the number of consignees in the route and the percent of total floor space allocated to the route. The Brown Route was allocated 20.4 percent of the available floor space. It has the largest number of consignees and the highest percentage of both the total adjusted and pre-ALOC volumes.

Table 4-5

SURFACE MATERIAL RECEIVED BY ROUTE
ADJUSTED FOR ALOC

Route	Volume Received Cu. Ft.	%
Green A	124,539	12.5
Red B	95,307	9.6
Purple	52,329	5.2
Green B	44,741	4.5
Yellow	44,159	4.4
Isolated A	21,313	2.1
Isolated B	30,612	3.1
Blue	95,927	9.6
Orange	149,471	15.0
Red A	47,341	4.7
Brown	258,694	25.9
Isolated C	120	.01
Isolated D		
Unknown	33,290	3.3
TOTAL	997,843	

Table 4-6

Surface Material Received Adjusted for ALOC by Consignee for Brown Route

Consignee	Volume Received Cu. Ft.	%
WK4EX4	2,674	1.0
WK4EYE	0	
WK4EYJ	89,618	34.9
WK4FR5	0	
WK4FV2	3,920	1.5
WK4FV9	24,276	9.5
WK4FWL	10	
WK4FW2	230	.1
WK4FW5	3,791	1.5
WK4F1A	2,359	.9
WK4F30	0	
WK4F83	12,872	5.0
WK4F88	48	
WK4GA1	7,471	2.9
WK4GA3	682	.3
WK4GA5	202	.1
WK4GAV	5,545	2.2
WK4GBW	66,963	26.1
WK4GBY	162	
WK4GBZ	148	
WK4GBO	6,776	2.6
WK4GB3	148	
WK4GB6	18,603	7.2
WK4GCB	3,170	.5
WK4GD8	254	.1
WK4GFC	2,794	1.1
WK4GFX	132	
WK4GGD	231	.1
WK4SGA	4,715	1.8
WK4UUB	900	.4
WK46B6	0	
TOTAL	258,694	

Table 4-7

ALLOCATION OF FLOOR SPACE

Route #	Percent of Total Volume (less ALOC)	Number of Consignees	Percent of Total Floor Space
1	12.5	24	8.5
2	9.6	25	7.3
3	5.2	12	6.2
4	4.5	16	4.2
5	4.4	16	4.2
6	2.1	6	4.6
7	3.1	5	4.6
8	9.6	22	7.3
9	15.0	24	13.9
10	4.7	16	5.8
11	25.9	28	20.4

The Plan-o-graph

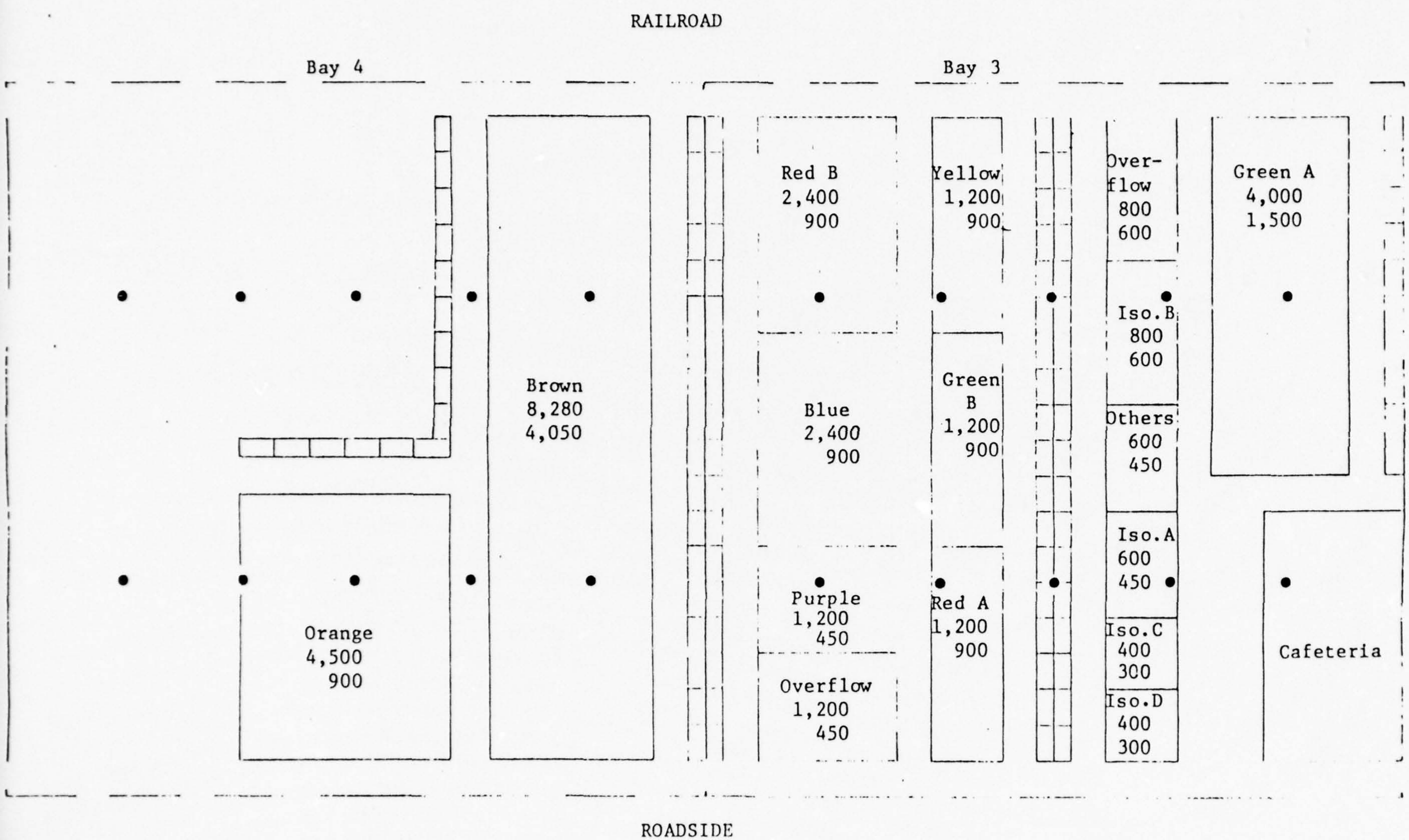
The plan-o-graph approved by CCP personnel is shown in Figure 4-7. The location of each cluster is identified. The number of racks per cluster is also included.

Racks are available in several dimensions. Generally, 5' x 10' racks will permit storing four pallets in each rack and two on top of the rack. Thus six pallets can be stored in each section.

Upright Truss construction specifications consist of:

1. Columns punched for two inch vertical adjustability are seam welded tubes (not C-channel).
2. Diagonal Braces are welded in place in an x-pattern, thereby packing the bracing in tension, eliminating the possibility of buckling which is often the result of using compression bracing patterns.
3. Horizontal Braces are square tubes (not C-channel or angle) of narrow width so that the two inch adjustability of load carrying beams is not interferred with in any way.
4. Floor bearing plates welded to base of each column for floor anchoring where required and for receiving shims where required.

Beams are of tubular construction to resist torsional forces even in long spans. Connector angles welded at each end are constructed to engage three planes of each column in a wrap-around grip with increase of frictional



Scale 1/4" = 10'
● = Support Beam
Top Number = sq. ft. of allocated floor space
Lower Number = sq. ft. of rack space

Figure 4-1

forces as the load increases. Four points of connection using the connector between connector angle and column provide sixteen points of connection at each load level.

Movable racks are available and will provide the flexibility required to change route storage size and/or location. Changing route consignee structure can be readily accomplished by moving consignee identification signs from one rack to another.

The concept also provides the loader with opportunity to complete his paper work within the route storage area, thereby allowing him to check data and/or material rapidly without walking from one location to another. This setup coupled with better lighting should result in improved input data and better facsimiles.

Cost of Racks

Cost estimate for the purchase of 97 racks was obtained from the Advanced Equipment Co. Incorporated, Capitol Heights, Maryland. The estimated cost is $10,000 and is based on the purchase of the total amount. An increase in the unit price is imposed for orders less than $10,000.

LIGHTING

Background/Approach

Lights placed overhead include the use of standard light bulbs. The lights appear to be circa pre World War II.

Study team members using a color and cosine corrected light meter measured the amount of light (in footcandles) in each of the five bays in Building 83.

The measurement of light intensity in the warehouse was taken. Measurements were made in all 4 corners and at each support beam in each bay. Results shown in Table 4-8 indicate lighting facilities in the surface area are less than adequate. The air and receiving loading areas, however, are equipped with an equal number of high intensity lights that provide adequate lighting for all receiving and loading functions.

Table 4-8

WAREHOUSE LIGHT VARIATION

By Bay

Bay	Activity	Meter Reading	Footcandles
1	Receiving	low	18
		high	78
		average	56
2	Surface Loading	low	2
		high	5
		average	4
3	Surface Loading	low	2
		high	7
		average	5
4	Cubitron	low	5
		high	75
		average	52
5	Parcel Post	low	3
		high	38
		average	22

Installation of high intensity lights similar to those in the air and receiving sectors will provide sufficient light in the surface area for loaders and forklift operators to better perform their functions. Discussion with CCP personnel revealed that a requisition for high intensity lights to replace lights in the surface area has been submitted. The request is under consideration by the Base Engineers (their understanding is that the request has been approved but funds are lacking).

RECOMMENDATIONS

Improving the physical facilities can, although secondary in nature, have a beneficial effect on van utilization. Better lighting, readily visible route/consignee markers, greater accessibility to all material and the opportunity to perform paper work within each route storage area should provide the incentive to do better work and decrease human errors.

Recommended improvements to the surface loading area include:

- Increase the available light in the surface loading area to be equal to the other loading areas.
- Install racks to provide additional storage area and route boundary markers.
- Provide well placed markers to identify routes and consignees.
- Provide work desks for use by loaders that are near routes they are responsible for.

Recommend transfer of 32 low volume customers from surface to air transportation.

Chapter 5

OPTIMIZING MODEL

BACKGROUND

During the conduct of the study the possibilities of developing a model to simulate van loading within the constraints placed on the CCP was discussed. Although no simulation model is perfect, the study members undertook the task. The model developed is an optimization model that attempts to build optimal van loads within the assigned constraints.

Data for use in the model was provided by NCAD. The data provided covers a three month period - August, September and November of 1976. Only two months data were used in the study due to technical problems that were encountered in processing the November tapes. However, two months should be sufficient to provide confidence in model results.

The model is operational on a third generation computer (IBM 370-168). It is programmed in FORTRAN IV and requires very short computer operating time (6 CPU seconds for 2 months simulation of the Brown route).

The program is located in Appendix D to this report.

PROBLEM

There are three principal functional requirements for CCP operation which will reduce transportation costs and average response times.

They are:

1. Minimize the number of consignees in each container
2. Maximize the amount of cargo in each container
3. Minimize the time cargo is held at the CCP for consolidation and loading

Operational experience established that a lack of sufficient cargo volume for the average consignee makes it impossible to meet all three objectives. Further, study results indicate that large consignees are shipped several partially loaded vans aboard the same vessel and overall utilization of vans is less than 60%.

Table 5-1 shows the number of 35 foot vans shipped to Brown Route consignees aboard the same vessel (14 August 1976). A complete listing is in Appendix E.

Table 5-1

CONSIGNEE VOLUME/SHIPMENT/SIZE OF VAN
(SELECTED UNITS)
August 14, 1976

Consignee	35 ft Van
WK4F83	1311,225,875
WK4FV9	753, 319, 177, 377, 52, 1354, 1679
WK4GA3	1255, 1281, 1353
WK4EYJ	586, 760, 1293, 779, 1771, 596, 1716, 714
WK4GBW	1130, 1248
WK4GA1	1043

The table shows that WK4EYJ was shipped eight 35 foot vans aboard the same vessel. The total volume shipped was 8215 cu. ft. or an average of 1027 cu. ft./35 ft. van. A 35 ft. van has a maximum volume of 2240 cu. ft. with 1027 cu. ft. representing a utilization of 45.8%. If a 5% reduction for dunnage is applied, the utilization is just over 50%. If the utilization was increased to 60%, only 6 vans would be utilized. At 70% only 5 vans would be shipped.

Recognizing that other consignees within the cluster may also be loaded on the van, there still is a high probability that its utilization can be improved. The CCP shipped a total 6346 vans in 1976. CCP personnel estimate a total of 6000 vans will be shipped in 1977; however, ALOC should create a large impact on that number. Considering the effect of ALOC, it is more than likely that 4000-4500 vans will be shipped to USAEUR. If improved utilization of vans can be improved by 5%, it will reduce that number by 1 van per working day (200/year). This will result in a savings of $350,000 during 1977.

MODEL DESCRIPTION

The constrained optimization simulation model developed builds van loads based on alternative loading policies. The model considers such variables as consignee, hold time, van capacity, operating policies, and weight and cube to optimize loading factors using historical CCP shipment data.

The input data required includes:

1. Maximum number of consignees per van
2. Maximum hold time employed
3. CCP receipt date
4. DSU WK identification codes by cluster or drop point
5. CCP load rules by van size
   a. Minimum volume of container
   b. Optimum volume of container
   c. Maximum volume of container
6. Van closing dates to meet scheduled sailings
7. Maximum weight
8. Volume

Because the study is only concerned with surface shipments, priority designation of material is not relevant.

ASSUMPTIONS/CONSTRAINTS

The model operates under the following assumptions and constraints. The assumptions are necessary to produce as realistic a simulation as possible within the given constraints.

Assumptions

1. The top, bottom and sides of each item is considered to be a flat surface to permit stacking whenever necessary
2. The number and size of vans are unrestricted
3. Storage space is also unrestricted
4. Personnel requirements can be met

In the actual situation many items are shipped that are outsized, contain sharp points thereby prohibiting stacking material on top, fragile material also must be shipped either on top of other material or on the floor of the

van without stacking material on top. The model, however, must, out of necessity, assume that material on pallets can be stacked one on the other.

The assumption that there are sufficient number of vans to accommodate surface shipments to USAREUR is valid. The last two assumptions are also valid based on observations made during the study period.

Constraints

Several constraints were placed on the model developer, each constraint has been justified to and approved by the SAG.

- Ship sailing days are: Tuesday, Friday, and Saturday
- Subtract 5% of permitted volumes for "dunnage"
- Use CCP van size determination
- Use 42,000 lbs. for maximum weight
- Limit number of consignees per van to 5
- Vary hold time using 6, 8, and 10 days
- Use TX4 data
- Eliminate hazardous cargo
- Vans that weight-out before cubing out will be considered as 100% loaded
- Use total volume to compute percent fill

Ship sailing days were derived from data obtained from the transportation section of NCAD. Table 5-2 shows the number of sailings by day of the week and the van size accepted by the vessels. A complete list of sailings for the two month period is shown in Appendix E.

VANS AND VOLUME/VAN SHIPPED

The CCP uses a fixed percentage of the van's absolute volume as a maximum. These and optimum and minimum van volumes are also parameters included in the model. In order to insure that pallets remain in a stationary position during movement, "dunnage" is used. To account for this, 5% was subtracted from the permitted volumes for each van size.

In the past, weight was not considered in the percent utilization computations. The model, however, does consider weight to identify vans weights out before they are filled. When this situation occurs, a 100% utilization factor is assigned to the loaded van.

Table 5-2

NUMBER OF SAILINGS BY VAN SIZE ACCEPTED

BY DAY OF WEEK

(Period 3 August thru 3 October)*

Day of Week	Number of Sailings	Number Accepting 35 Foot Vans	Number Accepting 20/40 Foot Vans
Tuesday	7	0	7
Friday	6	0	6
Saturday	9	8	8
Sunday	1	0	1

*9 weeks

A study of available data shows that some hazardous cargo is shipped with regular cargo. This phenomenon was not duplicated in the model because all hazardous material was deleted from the data base.

INPUT DATA

Data input for the model was obtained from NCAD/DMIS. Historical data were provided for a three month period. Due to processing difficulties, however, only tow months data were used in the model runs.

Results were initially obtained for three routes, Brown, Yellow and Isolated A, to determine if further model runs were required. It was determined that results obtained for the three routes formed a sufficiently large sample to draw inferences regarding model output when compared to observed data.

MODEL LOGIC

The model as designed, loads vans 4 days per week; Tuesday through Friday. Its original design was altered to simulate the CCPs operating procedure for 35 foot vans and the recent directive to eliminate the use of 40 foot vans from the model.

The model logic attempts to load single consignee vans using either weight or cube. The logic sequence is as follows.

1. Aggregate total weights and volumes for each drop point for a given time interval.
2. Construct single vans for consignees having total weight in excess of 42,000 lbs.
3. Construct single vans for consignees having weight or cube in excess of "optimum" loads.
4. Assign consignees to vans in order to maximize volume utilization subject to:
    a. Total weight of a van less than 42,000 lbs.
    b. Number of consignees per van less than preassigned maximum (5 used for each van type).
    c. Total cube per van must exceed minimum value.
5. When assignments cannot be made according to 4 above, close remaining vans shipping only cargo that cannot be held for the next interval.

MODEL RESULTS

Figure 5.2 indicates an example of detailed output of the model for the time interval of day 235-238. A total of 587 TX4's were available

```
235 - 238    587      1       1       1
     CONSIGNEE    VOL      WT      #ITEMS
   2 WK4EX4        67      802        3
   5 AK4385      2088    30623      207
   6 WK4GA3       306     3418        7
   7 AK4SB1         2       45        1
  12 WK4FW2        38      278        7
  15 AK4429         3       12        1
  16 WK4GBY       373    15054       23
  17 AK4431        33      360        4
  18 WK4GBZ      1693    51601       50
  19 AK4129       981    26213       15
  22 WK4SGA        97     2390        5
  25 AK4383        18      588        2
  26 WK4GA1       380     6495       23
  30 WK4UUB        34      343        4
  31 WK4GGD         5      198        1
  33 WK4F1A        11      174        3
  35 WK4FW5        52      563        9
  37 WK4GBW      1593    14650       47
  39 WK4EYJ      7698   166523       72
  42 WK4FV9      1560    20962       47
  44 WK4FWL         5       30        1
  45 WK4GBV        60      768        4
  47 WK4GB6       879    26850       44
  51 WK4GB3        10       74        2
  54 WK4FV2       313    16369        5
PREV XNS FOR TYPE 3 APPLIED TO TYPE 2
SHIP VAN TYPE  2     1110        1   42000      1060     1
PREV XNS FOR TYPE 3 APPLIED TO TYPE 2
SHIP VAN TYPE  2     1495        1   42000       675     2
PREV XNS FOR TYPE 3 APPLIED TO TYPE 2
SHIP VAN TYPE  2     1092        1   41999      1078     3
SHIP VAN TYPE  3     2170        1   38929         0     4
SHIP VAN TYPE  3     2169        1   32697         1     5
*SHIPPED SINGLE VAN TYPE   3, USER   5  2088 30623
SHIP VAN TYPE  3     2088        1   30623        82     6
*SHIPPED SINGLE VAN TYPE   1, USER  19   981 26213
SHIP VAN TYPE  1      981        1   26213        19     7
*SHIPPED SINGLE VAN TYPE   1, USER  47   879 26850
SHIP VAN TYPE  1      879        1   26850       121     8
VAN TYPE   1, CUST #   1 10898    772 WK4EYJ     228
VAN TYPE   1, CUST #   2  2390     97 WK4SGA     131
VAN TYPE   1, CUST #   3   802     67 WK4EX4      64
VAN TYPE   1, CUST #   4   768     60 WK4GBV       4
```

Figure 5-2. Detailed Model Output

Figure 5-2 (Contd)

```
SHIP VAN TYPE  1       996          4   14858          4   (9)
VAN TYPE  2, CUST #    1 14650   1593 WK4GBW       307
VAN TYPE  2, CUST #    2  3418    306 WK4GA3         1

SHIP VAN TYPE  2      1899          2   18068          1   (10)
VAN TYPE  2, CUST #    1 20962   1560 WK4FV9       340
VAN TYPE  2, CUST #    2 16369    313 WK4FV2        27

SHIP VAN TYPE  2      1873          2   37331         27   (11)
VAN TYPE  1, CUST #    1  9601    583 WK4GBZ       417
VAN TYPE  1, CUST #    2  6495    380 WK4GA1        37

SHIP VAN TYPE  1       963          2   16096         37   (12)
VAN TYPE  1, CUST #    1 15054    373 WK4GBY       627
VAN TYPE  1, CUST #    2   563     52 WK4FW5       575
VAN TYPE  1, CUST #    3   278     38 WK4FW2       537
VAN TYPE  1, CUST #    4   343     34 WK4UUB       503
VAN TYPE  2, CUST #    1   360     33 AK4431      1867
VAN TYPE  2, CUST #    2   588     18 AK4383      1849
VAN TYPE  2, CUST #    3   174     11 WK4F1A      1838
VAN TYPE  2, CUST #    4    74     10 WK4GB3      1828
VAN TYPE  3, CUST #    1    30      5 WK4FWL      2165
VAN TYPE  3, CUST #    2   198      5 WK4GGD      2160
VAN TYPE  3, CUST #    3    12      3 AK4429      2157
VAN TYPE  3, CUST #    4    45      2 AK4SB1      2155
CLOSE VAN TYPE  1      4   497    503                      (13)

SHIP VAN TYPE  1       497          4   16238        503
CLOSE VAN TYPE  2      4    72   1828                      (14)
PREV XNS FOR TYPE 2 APPLIED TO TYPE 1

SHIP VAN TYPE  1        72          4    1196       1828
CLOSE VAN TYPE  3      4    15   2155                      (15)
PREV XNS FOR TYPE 3 APPLIED TO TYPE 1

SHIP VAN TYPE  1        15          4     285       2155

                  Σ%    WEIGHT
INTERVAL SMRY    UTIL   SHIPPED   REMAIN    MIN    OPT    MAX
1  20     7      4403   101736     2597     600    850   1000
2  35     5      7469   181398     2031    1250   1800   1900
3  40     3      6427   102249       83    1300   2050   2170
```

for loading during this period, some, because of hold time constraints, were shipped during the interval and others which could be deferred to the next interval.

Starting with the second line, the aggregated cubes and weights available for each drop point/consignee are indicated.

The transactions that occurred during the simulation have been numbered for ease of reference. Also pairs of lines have been linked where they pertain to a single transaction. Transactions 1, 2 and 3 represent a situation of weighted-out vans. Transactions 4-7 represent single van loading situations where sufficient volumes are available to exceed the optimum cube capacity of some type of van.

Transactions 9-12 represent the standard operation of loading vans in the model. That is, selections of van type and cube to load are repeatedly made with the objective of maximizing the utilization of the remaining capacity of available vans.

The information given following 12 depicts the phenomenon of closing the interval. It is obvious that with the volumes that are available, the required minimum volumes cannot be attained for any van. To compensate for this phenomenon, an occasional relaxation of the constraint of the number of consignees per van is one solution. Another is the extending of permissible "hold times," and of course "ash and trash" vans are a practical answer.

Summary results obtained for the interval are the last items indicated in the figure. It is worth noting that the number of 20' vans shipped (7) includes three of the "close-out" vans.

The situation of inefficient van utilization that was discussed earlier in this chapter can be avoided. A two week sample of shipments made for the two largest consignees in the Brown Route is presented in Figure 5-3. It can be seen that whenever a number of vans were shipped on the same sailing date, that number less one of the vans were either weighted-out or at more than optimum capacity.

It must be recognized that the model does not consider several real world factors and has the benefit of perfect viewing of all receipts prior to loading at the close of an interval. However, this may not be as absurd as it appears. What may be deduced from the simulation is as

Table 5-3

SAMPLE OF SHIPMENTS FOR SPECIFIED SAILING DATES

Consignee	Sailing Date	No. Vans	Van Size	Volume
WK4GBW	Saturday	1	35	1514
	Tuesday	1	20	422
	Friday	1	35	1282
	Saturday	2	20	530
			40	2111
WK4EYJ	Saturday	3	20	900 (W)*
			20	493
			35	2658 (W)
	Tuesday	2	20	296
			40	1960 (W)
	Friday	1	20	501
	Saturday	3	20	1003 (W)
			35	1695
			40	2151

*(W) = Weighed Out

follows. As a total up-to-the-minute portrayal of cargo on the floor becomes more of a reality, we approach the ideal situation depicted by the model.

Results of analysis of historical data and model results are shown in Table 5-1. Shown by type of van are number of vans shipped, percent utilization, average volume, and the number weighed out before they were filled. The average volume and percent utilization shown include 100 percent volume for weighed out vans.

The table shows that, as one would expect, model results are much better than the observed. A total of 251 vans were recorded as shipped, however, for the same period, a maximum of 195 vans were shipped by the model (6 day hold). It would be unrealistic to expect the CCP to achieve a 22% reduction in the number of vans shipped to Brown Route customers for obvious reasons:

- Material configuration prevents stacking pallets
- Fragile material cannot be stacked
- Outsized material must be shipped in large vans
- Low volume customers
- Dock space for loading is limited

The table also shows that using maximum hold time of 6, 8 or 10 days does not appreciably change model results. This may be caused by the model's ability to hold all material until the day it is shipped, i.e., the material is loaded and shipped instantaneously at the end of the day. A difference of 5 vans (195 vs 190) were loaded by the model when 6 days and 10 days maximum hold time criteria were used.

A marked improvement in van utilization is shown between observed and model results. This can be due to the optimum stacking capability of the model and its ability to search for the correct volume to fill out available space in the van. However, van utilization may be improved by using the hold technique employed in the model. This will be discussed later in this section of the report.

Table 5-2 compares model results (using maximum 6 day hold time criterion) for Brown, Yellow and Isolated Route A. The table shows that as less material is available for loading van utilization deteriorates. This implies that additional hold time should be allocated to smaller routes.

Table 5-4

BROWN ROUTE OBSERVED
vs MODEL RESULTS

Van Size	Observed				MODEL RESULTS (maximum hold time)											
					6 Day H.T.-5 Consignees				8 Day H.T.-5 Consignees				10 Day H.T.-5 Consignees			
	No. of Vans	Avg Vol cu'	% Util	No. (W)*	No. of Vans	Avg Vol cu'	% Util	No. (W)	No. of Vans	Avg Vol cu'	% Util	No. (W)	No. of Vans	Avg Vol cu'	% Util	No. (W)
20'	59	652	51	1	87	1126	88	4	83	1152	90	3	80	1152	90	3
35'	164	1363	61	7	108	2083	93	14	109	2083	93	14	110	2083	93	14
40'	28	1412	55	1	*				*				*			
Total Vans Shipped	251				195				192				190			

*(W) = Weighed Out

**Model was constrained to use large and small vans (35' and 20')

IMPROVING UTILIZATION OF VANS

This section of the report will attempt to integrate all of the recommendations that were made regarding improving van utilization. Emphasis will be placed on information and storage facilities.

Information about availability of material either on the floor or enroute, is paramount in the CCP system as it is now designed. The loader must be made aware of all available material if he is to build better loads. Better and more frequent information will result in improved loads which should increase the loaders desire to build better loads.

Operating/procedural information is also essential to maintain a high level of motivation.

Storage space as allocated in the plan-o-graph, if utilized effectively, can provide the loader with considerable information just by looking over the material in a given sector.

Using the Brown Route (this is a valid selection because it offers the greatest opportunity for improvement) as an example, a total of 8,280 sq. ft. of floor space is available plus an additional 4,050 sq. ft. on racks. Consider that the bed of a 35' van is (8' x 35') 280 sq. ft.; then, 12,330 divided by 280 or the equivalent of 44 vans full of material can be stored if the material was stacked 8 feet high. Assuming the average height is 4 feet then, 22 vans full of material can be stored. Reduce the height to an average of 3 feet and the van utilization to 66%, then, 11 van loads can be accommodated in the allocated space.

A total of 251 vans were shipped during the 42 working days in the study period (59-20', 164-35', and 28-40'). This equates to 5.976 or 6 vans/day on the average. Using an average height of 4 ft/pallet between 3 and 4 days of material can be stored before it overflows its assigned area. This also indicates that the loader doesn't have to rush to move the material out of the storage; he can, in fact, wait within the above constraints, until material becomes available to build better loads.

The above approach can be further enhanced by moving material within a given route to provide the loader with additional insight to the volume, configuration, and hold time of available material.

Table 5-5

COMPARISON OF MODEL RESULTS FOR
BROWN, YELLOW AND ISOLATED A ROUTES

VAN SIZE	BROWN		YELLOW		ISOLATED A	
	MAXIMUM HOLD TIME 6 DAYS					
	No. of Vans	% Util	No. of Vans	% Util.	No. of Vans	% Util
20'	87	88	17	83	16	81
35'	108	93	20	89	23	85

Model results modified by real world situations and applied to available floor space indicate that the loader can build better loads if he is provided with accurate information and takes full advantage of all loading criteria, *i.e., storage space, number of consignees, holdtime, etc.*

Appendix A

FLOW DIAGRAMS OF CCP PROCEDURES

PP Processing C&C Division

Receives, Completes and Signs DARCOM 1615 DRXNC-T-805 Receipt Date

PP Conveyor Operator

Unloads/ Screens Prepares TX4

In Checker

Opens Documents--
- 1348-1, DD 1155, DD 250 Supplier-Shipper
- Assigns AK No. & Priority

Keypunch Operator

Checks for:
- BBC Card
  1 Enter Julian Date if Cards Are Present
  2 Prepares Both Cards from Documentation if Cards are Missing
  3 Sends for Research Arms if Insufficient Info
- DWA Card

PP Research Area

- Determine Consignee Assignments
- Determine Off-Line Processing Requirements; Forward to Hold Area
- Prepare Add ZCR Card (Speedex)
- Input ZCR to Computer

Sortation Console Operator

Enter 4-Digit Unit Designator Code 4 Priority 1, 2 or 3 into Console

MOBILE Parking Station (MPS) Operator

- Checks Overflow on Lines
- Places Container in Shipping Unit
- Places BBC & DWA Cards on Outside of Container
  1 Removes & Checks BBC & DWA Cards Against Ship. Levels
  2 Prepares TX4 Card Using C&C Transportation Control No. (TCN)

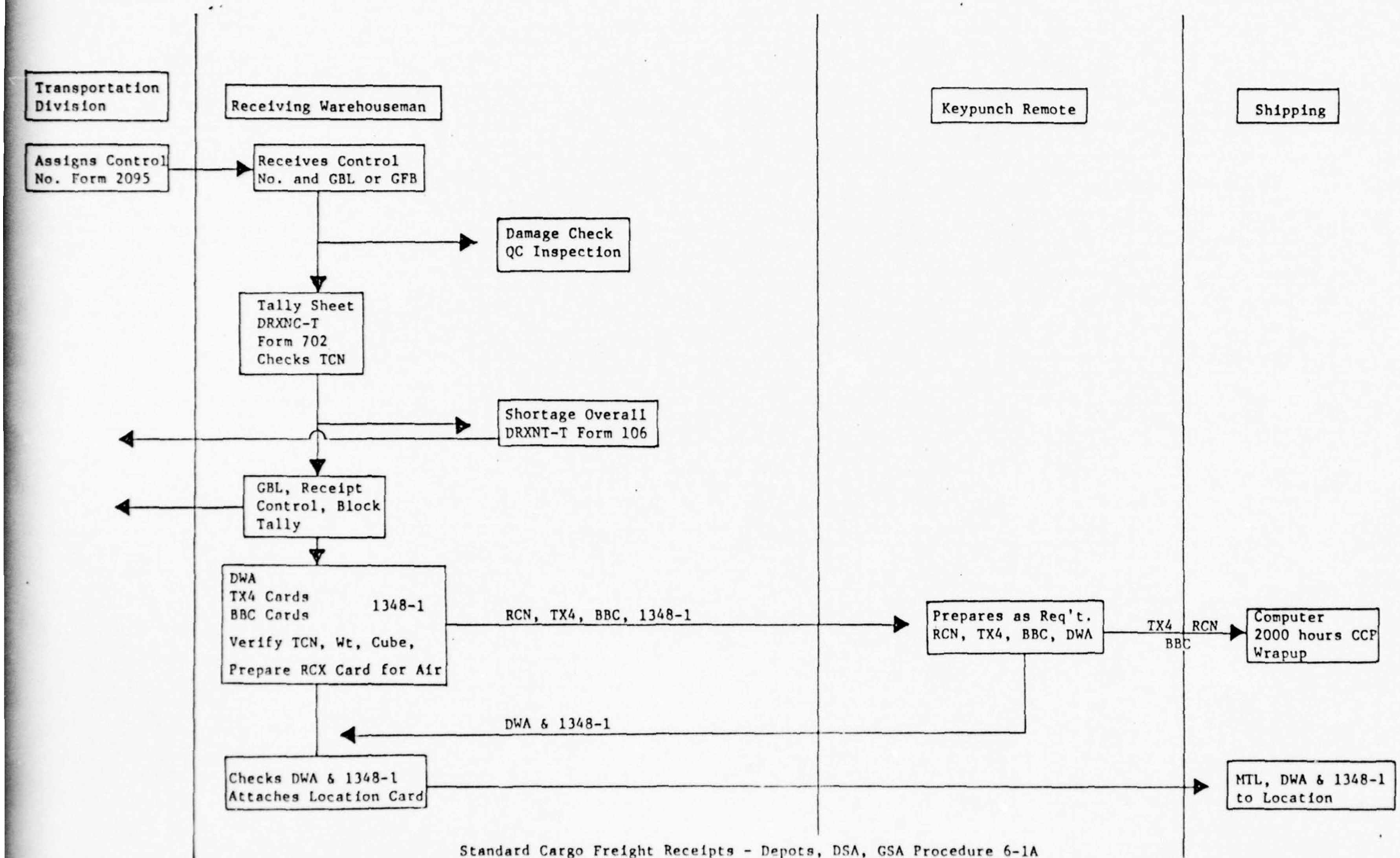
Keypunch Operator Control Room

- Controls Entry to Cubitron
- Enters W&E Cube Readings
- Prepares DA-1387 Label
  1 Enter W&E Cube on New TX4 Card
  2 Write W&E Cube on Handscribed Card
  3 Type DA-1387 Label with TCN, Pieces, Wt, Cube and Priority
  4 Carry TX4 and BBC cards to Site 4 for Speedex Entry

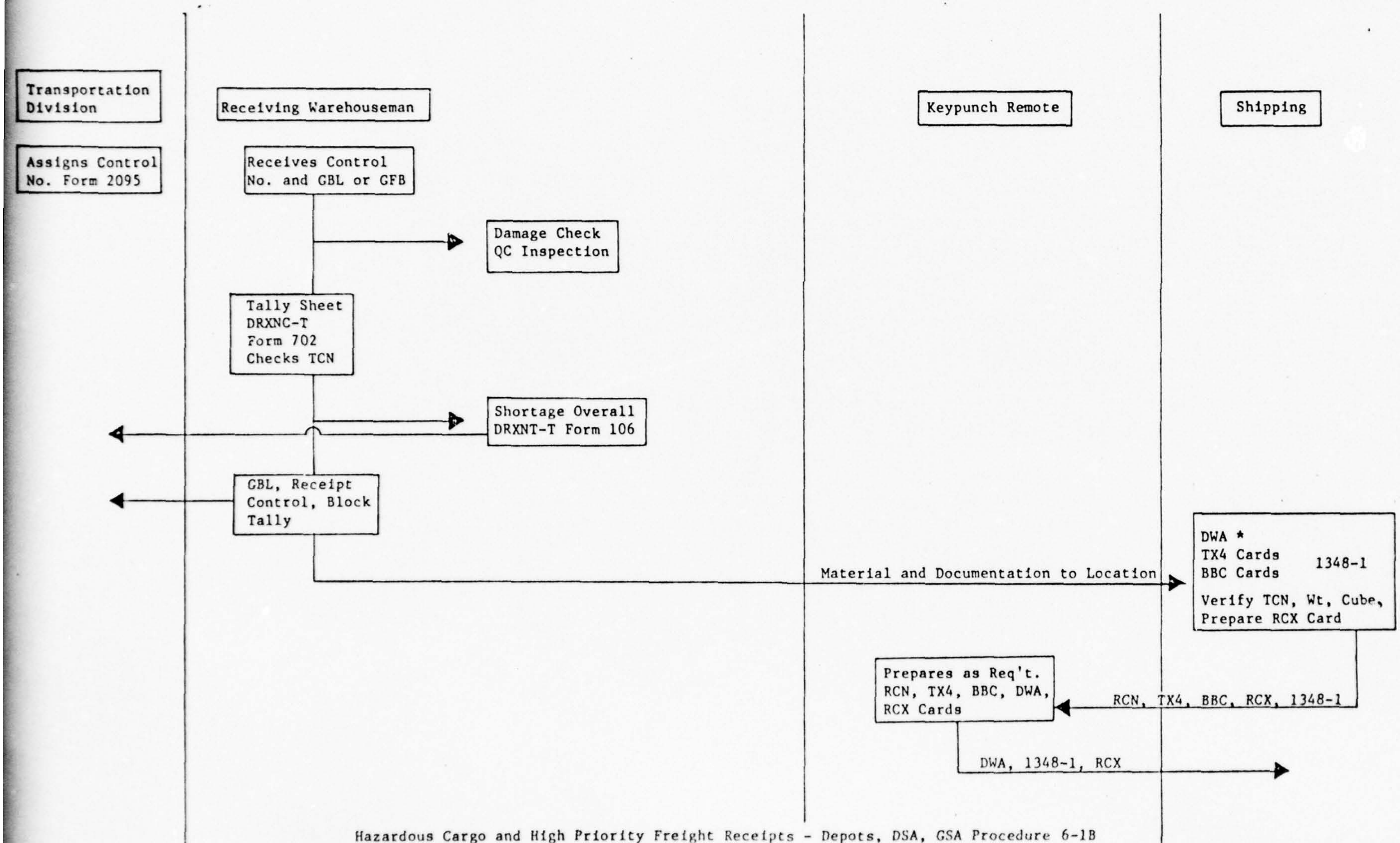
Marking and Strapping Area

- Attach DA-1387 Label.
- Mark Location on Container
- Send Appropriate Items to Shrink Pack Machine

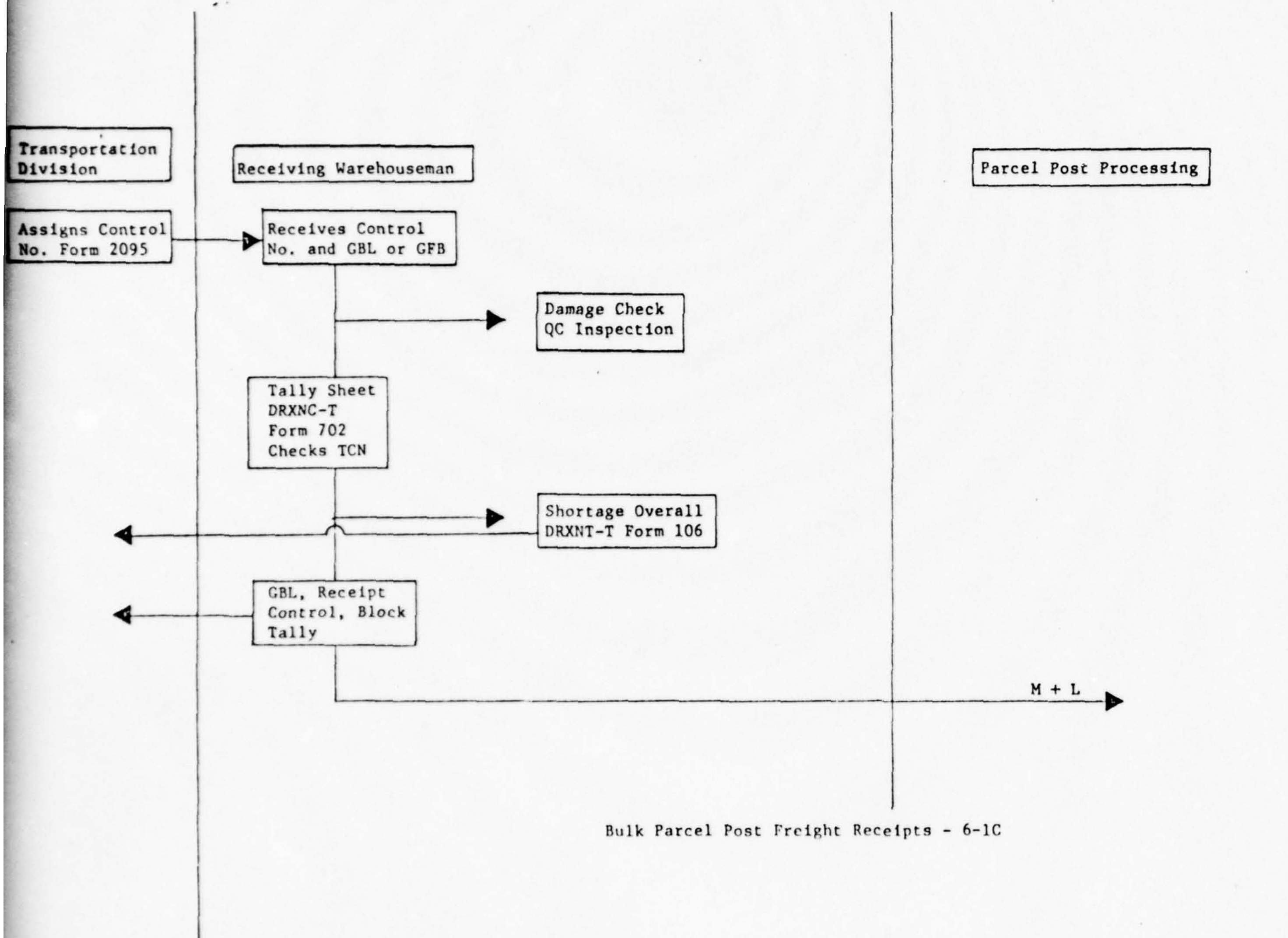
Parcel Post 5-1



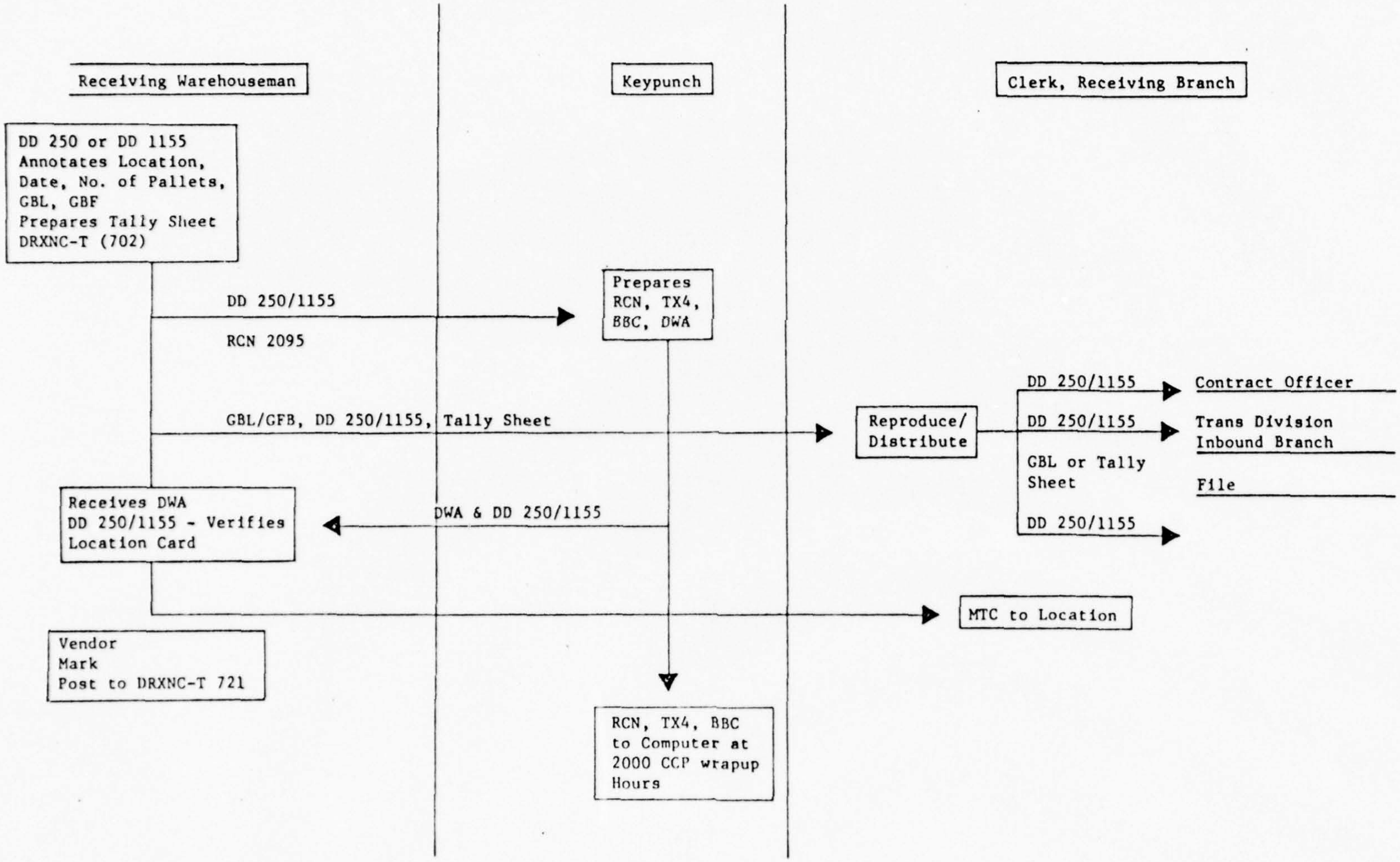
Standard Cargo Freight Receipts - Depots, DSA, GSA Procedure 6-1A



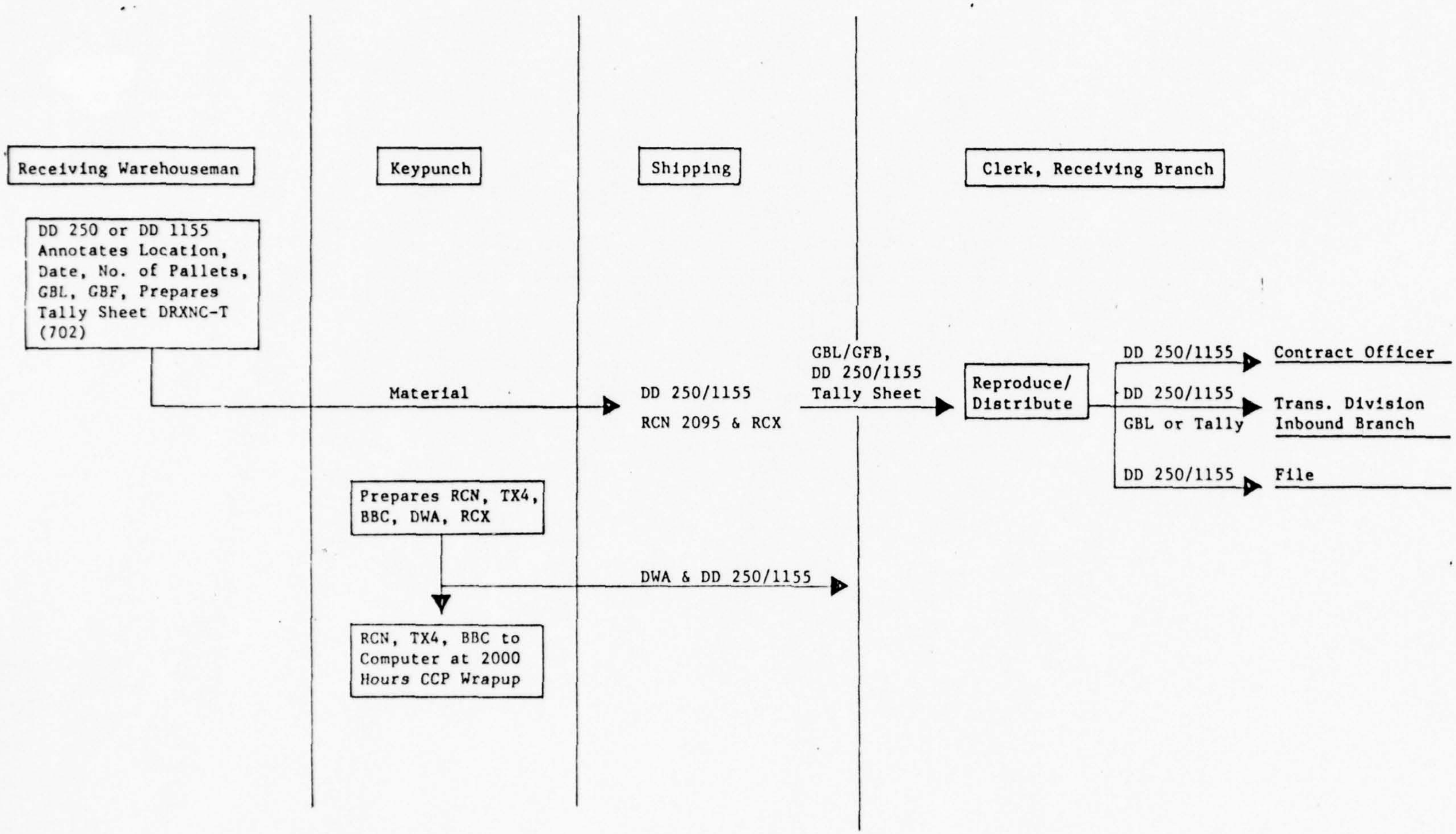
Hazardous Cargo and High Priority Freight Receipts - Depots, DSA, GSA Procedure 6-1B



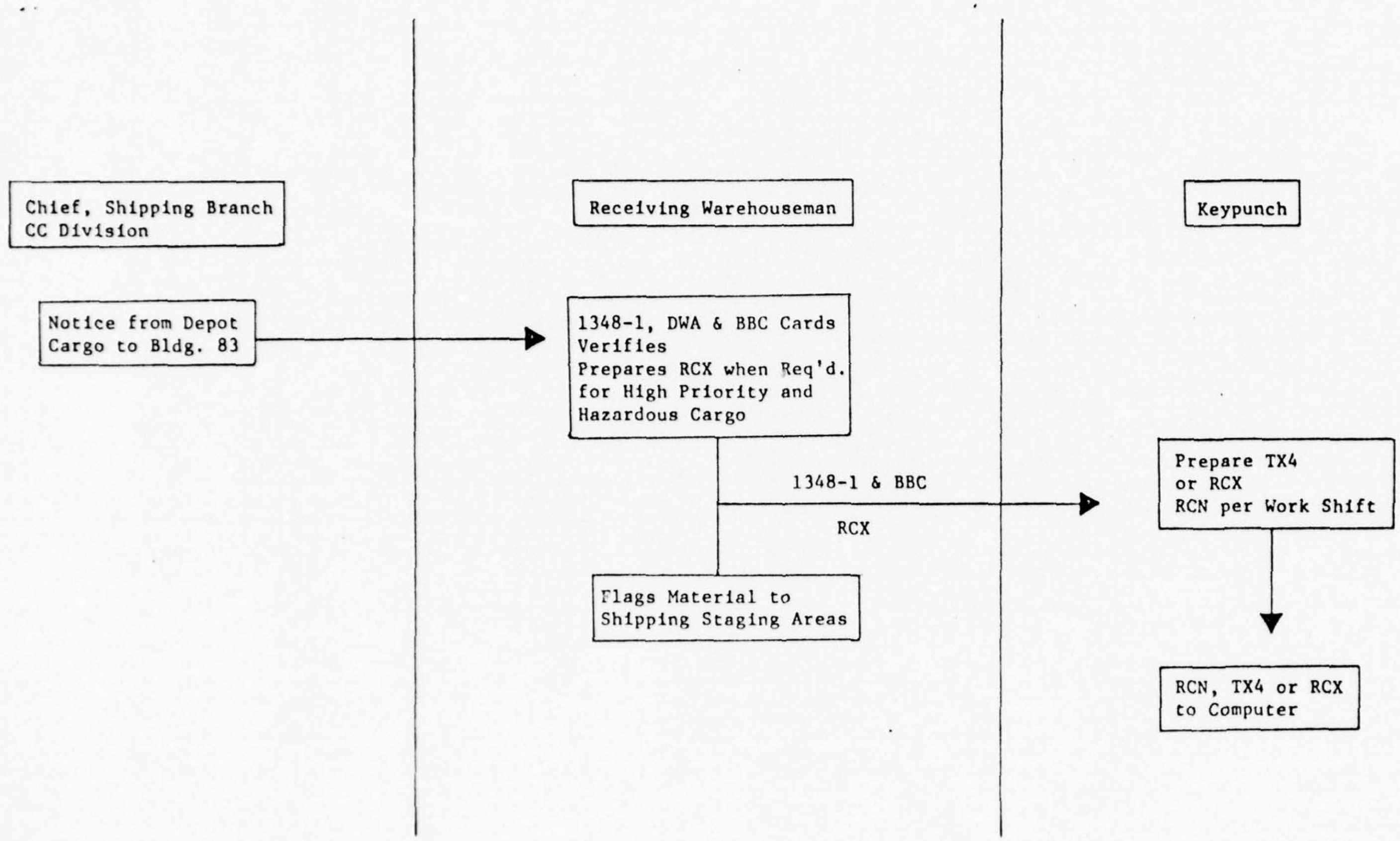
Bulk Parcel Post Freight Receipts - 6-1C



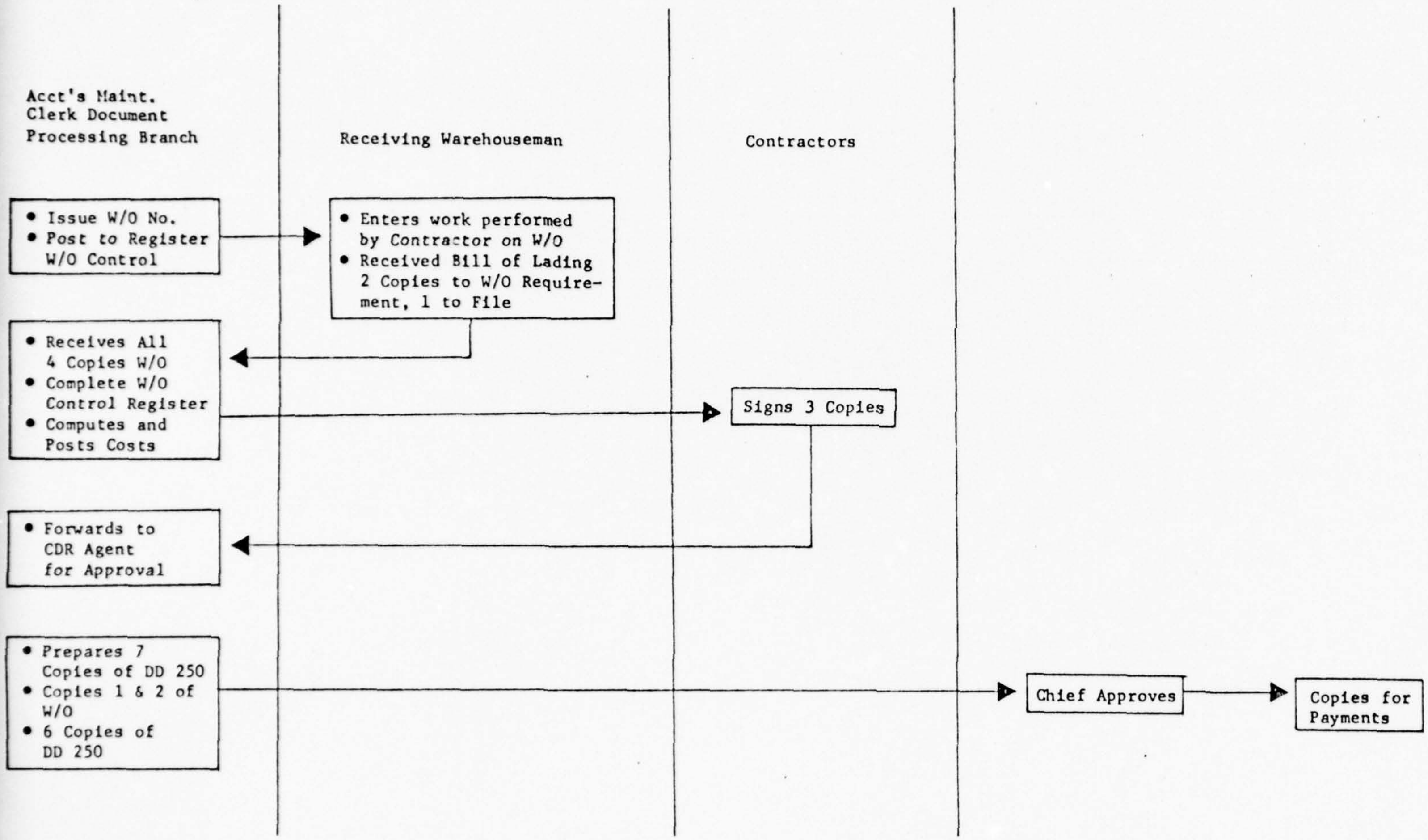
Standard Freight Receipts - Procurement Material 6-2A



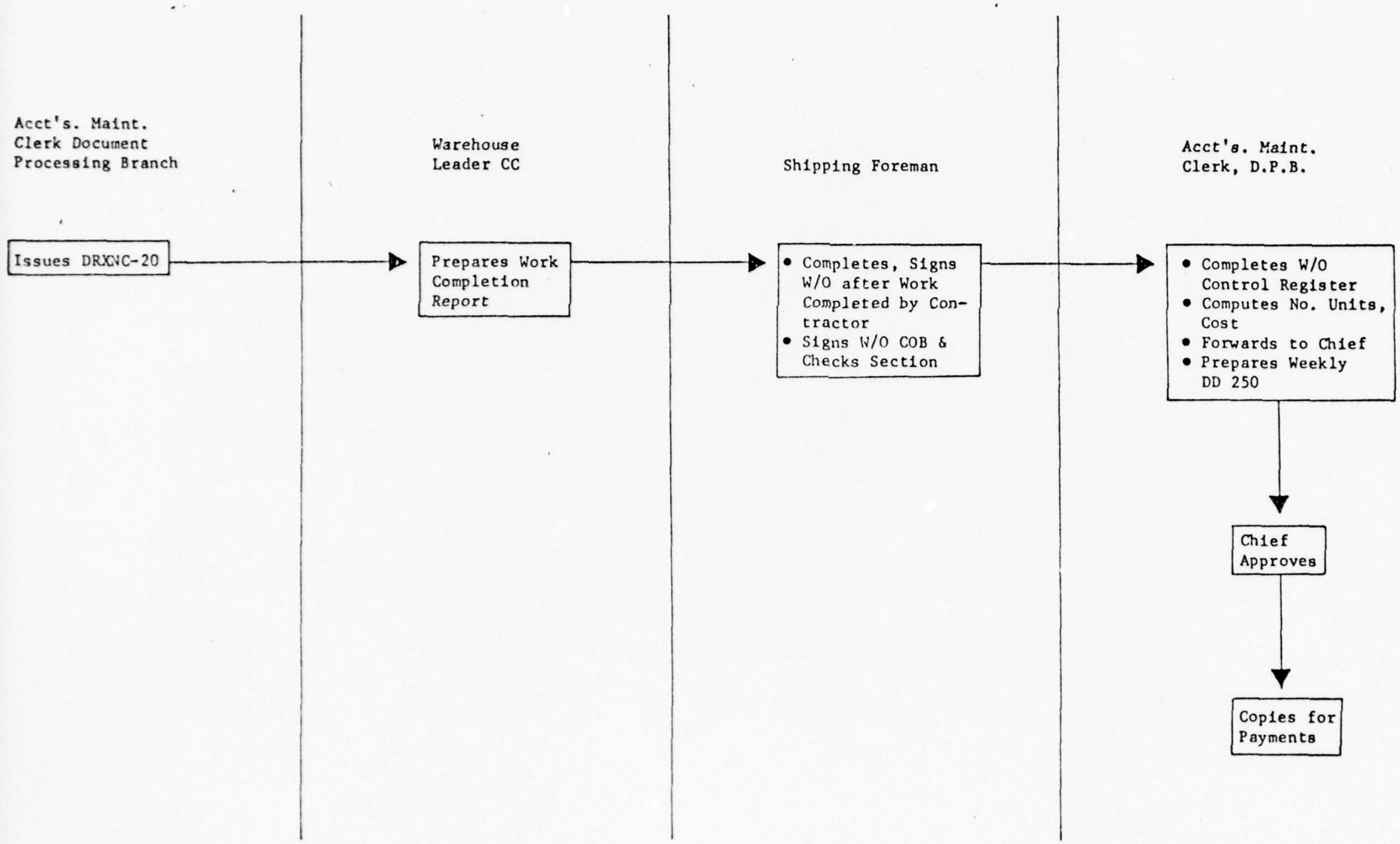
Hazardous, High Priority (AIR) and Divert Freight Receipts - Procurement Material 6-2B



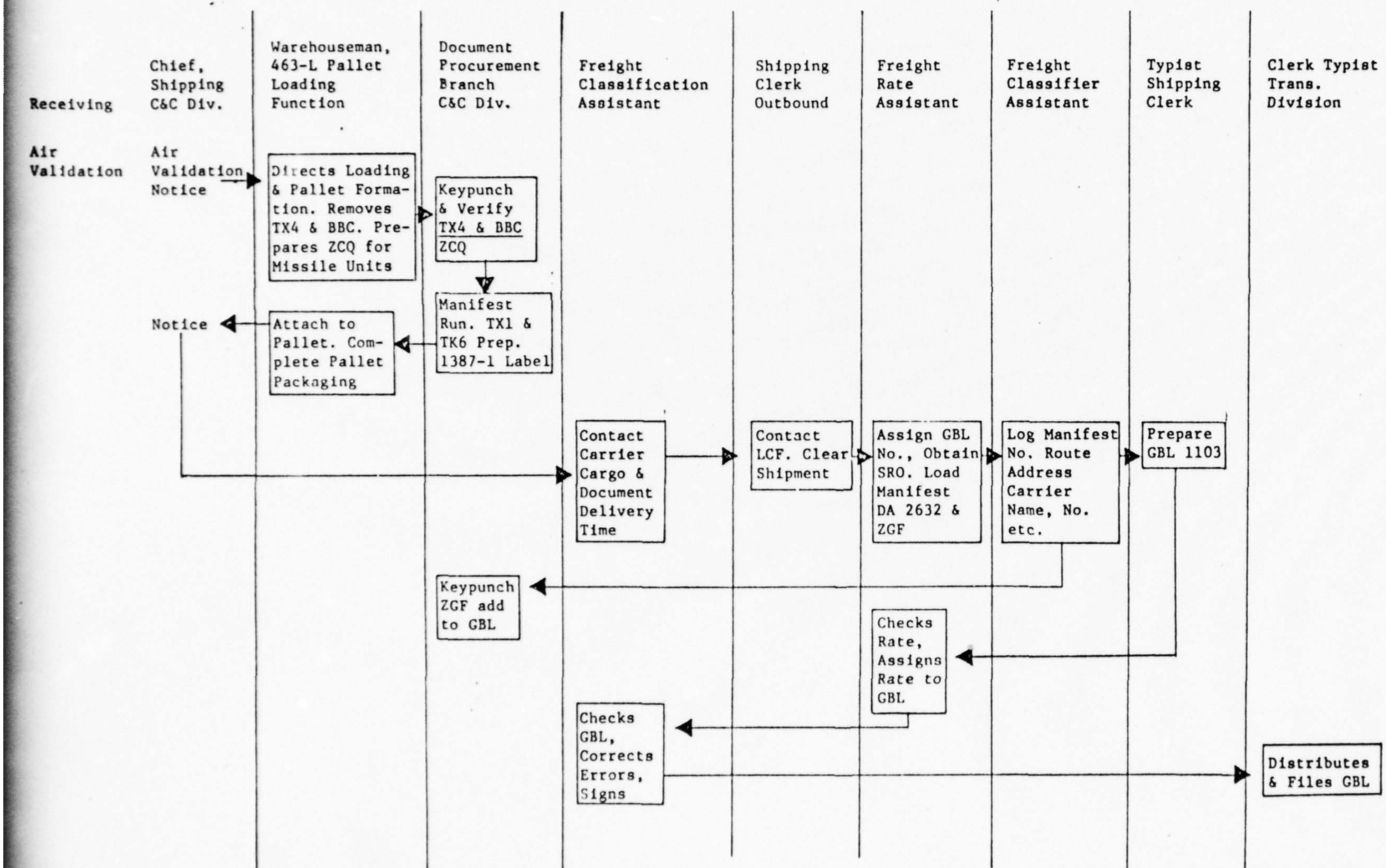
NCAD Generated Cargo 7-1



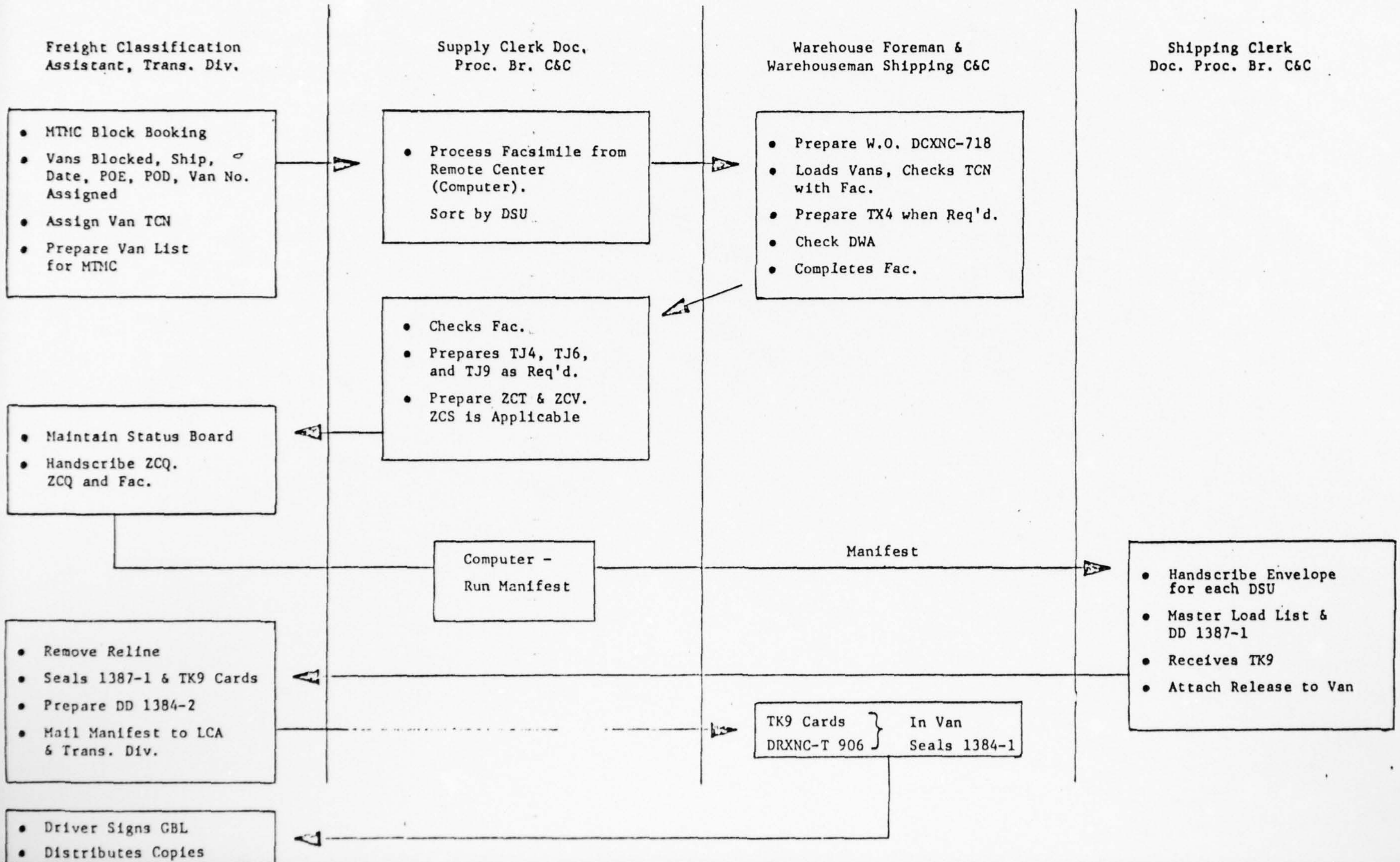
8-1 Unloading Work Order Control Processing



9-1 Preservation, Packaging, Marking Work Order Processing



Outloading 463-L Air Pallets 10-1



OUTLOADING SEAVANS - (11-1)

Appendix B

Adjusted Volume By Consignee Within Route

and

Pre ALOC Volume By Consignee Within Route

CLUSTER 1

GREEN A ROUTE

	PRE-ALOC			ALOC		
CONSIGNEE	SURFACE	AIR	TOTAL	SURFACE	AIR	TOTAL
WK4EX5	1,310	33	1,343			
WK4FRH	0	0	0			
WK4FT7	2,077	0	2,077			
WK4FUG	98,988	1,048	100,036			
WK4FYO	516	776	1,292			
WK4FY3	31,049	1,004	32,053			
WK4F2G	0	0	0			
WK4F2J	0	0	0			
WK4F2L	277	0	277			
WK4F32	169	2	171			
WK4F8V	2,618	252	2,870			
WK4GC1	46	1,411	1,457			
WK4GC2	6,665	895	7,560			
WK4GC5	449	72	521			
WK4GC6	441	115	556			
WK4GDP	8	0	8			
WK4GEA	150	1	151			
WK4GFL	1,919	0	1,919			
WK4GFS	1,102	0	1,102			
WK4GFO	270	0	270			
WK4NP7	7,691	88	7,779			
WK4SF6	0	0	0			
WK4SRQ	10,719	215	10,934			
WK4SRR	3,938	329	4,267			
WK4UT9	666	308	974			

CLUSTER 2

RED B ROUTE

	PRE-ALOC			ALOC		
CONSIGNEE	SURFACE	AIR	TOTAL	SURFACE	AIR	TOTAL
WK4EX9	973	334	1,307			
WK4FRD	0	0	0			
WK4FSA	0	0	0			
WK4FOQ	3,551	0	3,551			
WK4FOT	6,042	6	6,048			
WK4FOV	26,756	818	27,574			
WK4FO4	0	0	0			
WK4F8S	18	916	934			
WK4F8T	848	194	1,042			
WK4F9A	2,780	233	3,013			
WK4F9C	13,338	636	13,974			
WK4GDV	1,236	381	1,617			
WK4GDW	23,828	856	24,684			
WK4GDX	3,371	210	3,581			
WK4GDY	160	523	683			
WK4GD1	92	0	92			
WK4GD2	5,543	404	5,947			
WK4GD4	348	0	348			
WK4GD5	1,585	2,145	3,730			
WK4GEV	16,951	3,117	20,068			
WK4GEW	254	50	304			
WK4GFJ	3,170	0	3,170			
WK4GFR	5,638	0	5,638			
WK4GFZ	8,595	0	8,595			
WK4GF3	411	88	499			

CLUSTER 3

PURPLE ROUTE

	PRE-ALOC			ALOC		
CONSIGNEE	SURFACE	AIR	TOTAL	SURFACE	AIR	TOTAL
WK4EYA	12	0	12			
WK4FRK	1,790	0	1,790			
WK4FRQ	2,068	217	2,285			
WK4FR8	0	0	0			
WK4FU2	2	1	3			
WK4FZ4	34,540	220	34,760			
WK4FZ9	3	1	4			
WK4F3E	0	0	0			
WK4F8W	8,584	271	8,855			
WK4GCP	90	276	366			
WK4GC4	501	1,126	1,627			
WK4GDU	7,941	535	8,476			
WK4GFD	651	0	651			
WK4GFU	3,221	0	3,221			

CLUSTER 4

GREEN B ROUTE

	PRE-ALOC			ALOC		
CONSIGNEE	SURFACE	AIR	TOTAL	SURFACE	AIR	TOTAL
WK4CJR	5	95	100			
WK4EX7	1,513	1	1,514			
WK4F9R	193	173	366			
WK4F9T	3,009	2,366	5,375			
WK4F9V	543	186	729			
WK4F9X	15,483	446	15,929			
WK4F9Z	5,987	1,904	7,891			
WK4F90	3,923	4,572	8,495			
WK4F91	25,760	3,760	29,520			
WK4F93	149	594	743			
WK4F94	103	50	153			
WK4F95	467	68	535			
WK4F96	19,275	640	19,915			
WK4GAB	5,880	2,529	8,409			
WK4GDS	1,252	815	2,067			
WK4GFN	2,039	0	2,039			

CLUSTER 5

YELLOW ROUTE

CONSIGNEE	PRE-ALOC SURFACE	PRE-ALOC AIR	PRE-ALOC TOTAL	ALOC SURFACE	ALOC AIR	ALOC TOTAL
WK4EYC	1,072	5	1,077			
WK4FRZ	1	0	1			
WK4FUU	9,231	48	9,279			
WK4FUZ	0	0	0			
WK4FVK	6,592	77	6,669			
WK4F98	8,668	1,105	9,773			
WK4GAA	3,752	326	4,078			
WK4GAC	9,609	680	10,289			
WK4GAD	5,875	0	5,875			
WK4GAE	6,657	4	6,661			
WK4GAH	0	0	0			
WK4GAK	106	8,214	8,320			
WK4GAL	106	1,352	1,458			
WK4GA2	1,827	204	2,031			
WK4GFA	845	0	845			
WK4GFP	2,560	0	2,560			
WK4GFQ	1,047	0	1,047			

CLUSTER 6

ISOLATED A ROUTE

	PRE-ALOC			ALOC		
CONSIGNEE	SURFACE	AIR	TOTAL	SURFACE	AIR	TOTAL
WK4FSE	4,479	0	4,479			
WK4F8Q	31,253	584	31,837			
WK4F85	53	1,113	1,166			
WK4GFH	9,264	0	9,264			
WK4SN8	6,059	273	6,332			
WK4SN9	2,806	235	3,041			

CLUSTER 7

ISOLATED B ROUTE

	PRE-ALOC			ALOC		
CONSIGNEE	SURFACE	AIR	TOTAL	SURFACE	AIR	TOTAL
WK4FSR	10,776	599	11,375			
WK4FTK	490	0	490			
WK4FTN	6,627	115	6,742			
WK4F2A	979	0	979			
WK4F42	11,740	0	11,740			
WK4JLA	0	0	0			

CLUSTER 8

BLUE ROUTE

	PRE-ALOC			ALOC		
CONSIGNEE	SURFACE	AIR	TOTAL	SURFACE	AIR	TOTAL
WK4EX8	9,724	2	9,726			
WK4F2V	0	0	0			
WK4F2Y	0	0	0			
WK4F2Z	0	1	1			
WK4F22	4,741	0	4,741			
WK4F25	4,655	299	4,954			
WK4F27	0	0	0			
WK4F3K	50,291	102	50,393			
WK4F8Y	360	2	362			
WK4GAM	57	0	57			
WK4GAQ	4,858	514	5,372			
WK4GCN	221	1,117	1,338			
WK4GDR	5,337	422	5,759			
WK4GD3	0	0	0			
WK4GED	226	938	1,164			
WK4GEH	1,107	1,201	2,308			
WK4GEJ	15,553	1,773	17,326			
WK4GEL	1,999	290	2,289			
WK4GEM	4,648	334	4,982			
WK4GEN	4,801	1,083	5,884			
WK4GEP	6,485	609	7,094			
WK4GES	180	0	180			
WK4GET	14,496	1,154	15,650			
WK4GFK	8,373	0	8,373			
WK4GFT	0	0	0			
WK4GF2	3	551	554			
WK4RCV	161	25	186			

CLUSTER 9

ORANGE ROUTE

	PRE-ALOC			ALOC		
CONSIGNEE	SURFACE	AIR	TOTAL	SURFACE	AIR	TOTAL
WK4EX6	1,152	624	1,776			
WK4EYF	52,319	106	52,425			
WK4FV6	806	4	810			
WK4FXZ	352	3	355			
WK4FX4	2,210	15	2,225			
WK4FYS	36,151	188	36,339			
WK4FZB	321	350	671			
WK4FZC	665	118	783			
WK4FZD	1,070	1,630	2,700			
WK4FZL	1,485	0	1,485			
WK4FZN	2,127	1,548	3,675			
WK4FZV	4,026	13	4,039			
WK4FZ1	350	0	350			
WK4F33	429	2	431			
WK4GCL	2,766	181	2,947			
WK4GC3	0	0	0			
WK4GC7	0	0	0			
WK4GC9	905	30	935			
WK4GDB	0	2	2			
WK4GDC	13,031	2,078	15,109			
WK4GDD	7,491	997	8,488			
WK4GDK	28,905	1,066	29,971			
WK4GDL	0	0	0			
WK4GFY	1,962	273	2,235			
WK4POQ	30	9	39			
WK4QPU	32	302	334			
WK4R30	9,801	2,134	11,935			
WK4UUA	784	104	888			

CLUSTER 10

RED A ROUTE

	PRE-ALOC			ALOC		
CONSIGNEE	SURFACE	AIR	TOTAL	SURFACE	AIR	TOTAL
WK4EYD	391	1	392			
WK4FRW	5	0	5			
WK4F3N	450	0	450			
WK4F3Z	1,781	46	1,827			
WK4F80	51	1,011	1,062			
WK4F81	1,452	18	1,470			
WK4GEK	1,882	1,193	3,075			
WK4GEO	108	887	995			
WK4GE1	39	57	96			
WK4GE2	20,702	688	21,390			
WK4GE3	4,614	793	5,407			
WK4GE4	19,286	1,752	21,038			
WK4GE7	14,661	1,350	16,011			
WK4GFE	0	0	0			
WK4GF1	8,229	1	8,230			
WK4GF6	113	24	137			

CLUSTER 12

ISOLATED C ROUTE

	PRE-ALOC			ALOC		
CONSIGNEE	SURFACE	AIR	TOTAL	SURFACE	AIR	TOTAL
WK4F87	0	867	867			
WK4GDT	98	1,046	1,144			

CLUSTER 11

BROWN ROUTE

	PRE-ALOC			ALOC		
CONSIGNEE	SURFACE	AIR	TOTAL	SURFACE	AIR	TOTAL
WK4EX4	2,674	106	2,780			
WK4EYE	0	0	0			
WK4EYJ	89,618	4,155	93,773			
WK4FR5	0	0	0			
WK4FV2	3,920	1	3,921			
WK4FV9	24,276	1,469	25,745			
WK4FWL	10	0	10			
WK4FW2	1,007	377	1,384			
WK4FW5	3,791	78	3,869			
WK4F1A	2,359	463	2,822			
WK4F30	144	22	166			
WK4F83	12,872	1,257	14,129			
WK4F88	0	245	245			
WK4GA1	7,471	463	7,934			
WK4GA3	26,346	2,221	28,567			
WK4GA5	6	1,558	1,564			
WK4GBV	5,545	0	5,545			
WK4GBW	66,963	1,103	68,066			
WK4GBY	6,632	1,176	7,808			
WK4GBZ	6,572	51	6,623			
WK4GBO	6,776	0	6,776			
WK4GB3	148	170	318			
WK4GB6	18,603	1,345	19,948			
WK4GD8	52	930	982			
WK4GFC	2,794	4	2,798			
WK4GFX	132	0	132			
WK4GGD	231	12	243			
WK4SGA	4,715	12	4,727			
WK4UUB	900	44	944			

CLUSTER 13

ISOLATED D ROUTE

	PRE-ALOC			ALOC		
CONSIGNEE	SURFACE	AIR	TOTAL	SURFACE	AIR	TOTAL
WK3FQT						
WK3FQU						
WK3FQ3						

CLUSTER 16

	PRE-ALOC			ALOC		
CONSIGNEE	SURFACE	AIR	TOTAL	SURFACE	AIR	TOTAL
WK0FPV						
WK2FP7						
WK9GG9	13,143	113	13,256			
WK9GHK	15,824	502	16,326			
WM1Q7C	642	10	652			
WN7GX8	3,681	0	3,681			

Surface Material Received Adjusted for ALOC

by Consignee for Green Route A

Consignee	Volume Received Cu. Ft.	%
WK4EX5	1,310	1.1
WK4FRH	0	
WK4FT7	2,077	1.7
WK4FUG	98,988	79.5
WK4FY0	112	.1
WK4FY3	36	
WK4F2G	0	
WK4F2J	0	
WK4F2L	48	
WK4F32	0	
WK4F8V	102	.1
WK4GC1	112	.1
WK4GC2	540	.4
WK4GC5	64	
WK4GC6	26	
WK4GDP	8	
WK4GEA	4	
WK4GFL	1,919	1.5
WK4GFS	1,102	.9
WK4GF0	270	.2
WK4NP7	6,266	5.0
WK4SF6	0	
WK4SRQ	10,719	8.6
WK4SRR	170	.1
WK4UT9	666	.5
TOTAL	124,539	

Surface Material Received Adjusted for ALOC
by Consignee for Red Route B

Consignee	Volume Received Cu. Ft.	%
WK4EX9	973	1.0
WK4FRD	0	
WK4FSA	0	
WK4FOQ	3,551	3.7
WK4FOT	6,042	6.3
WK4FOV	26,756	28.1
WK4FO4	0	
WK4F8S	98	.1
WK4F8T	108	.1
WK4F9A	210	.2
WK4F9C	13,338	14.0
WK4GDV	74	
WK4GDW	23,828	25.0
WK4GDX	280	.3
WK4GDY	16	
WK4GD1	92	
WK4GD2	96	.1
WK4GD4	348	.4
WK4GD5	154	.2
WK4GEV	1,540	1.6
WK4GEW	254	.3
WK4GFJ	3,170	3.3
WK4GFR	5,638	5.9
WK4GFZ	8,595	9.0
WK4GF3	146	.2
TOTAL	95,307	

Surface Material Received Adjusted for ALOC

BY Consignee for Purple Route

Consignee	Volume Receiv Cu. Ft.
WK4EYA	12
WK4FRK	1,790
WK4FRQ	2,068
WK4FR8	0
WK4FU2	2
WK4FZ4	34,540
WK4FZ9	3
WK4F3E	0
WK4F8W	8,584
WK4GCP	112
WK4GC4	286
WK4GDU	1,060
WK4GFD	651
WK4GFU	3,221
TOTAL	52,329

Surface Material Received Adjusted for ALOC
by Consignee for Green Route B

Consignee	Volume Received Cu. Ft.	%
WK4CJR	20	
WK4EX7	1,513	3.4
WK4F9R	6	
WK4F9T	2,112	4.7
WK4F9V	154	.3
WK4F9X	15,483	34.6
WK4F9Z	304	.7
WK4F90	72	.2
WK4F91	1,632	3.6
WK4F93	502	1.1
WK4F94	103	.2
WK4F95	76	.2
WK4F96	19,275	43.1
WK4GAB	198	.4
WK4GDS	1,252	2.8
WK4GFN	2,039	4.6
TOTAL	44,741	

Surface Material Received Adjusted for ALOC

by Consignee for Isolated Route A

Consignee	Volume Received Cu. Ft.	%
WK4FSE	4,479	21.0
WK4F8Q	6,218	29.2
WK4F85	32	.1
WK4GFH	9,264	43.5
WK4SN8	1,014	4.8
WK4SN9	306	1.4
TOTAL	21,313	

Surface Material Received Adjusted for ALOC
by Consignee for Isolated Route B

Consignee	Volume Received Cu. Ft.	%
WK4FSR	10,776	35.2
WK4FTK	490	1.6
WK4FTN	6,627	21.6
WK4F2A	979	3.2
WK4F42	11,740	38.4
WK4JLA	0	
TOTAL	30,612	

Surface Material Received Adjusted for ALOC

by Consignee for Blue Route

Consignee	Volume Received Cu. Ft.	%
WK4EX8	9,724	10.1
WK4F2V	0	
WK4F2Y	0	
WK4F2Z	0	
WK4F22	4,741	4.9
WK4F25	4,655	4.9
WK4F27	0	
WK4F3K	50,291	52.4
WK4F8Y	360	.4
WK4GAM	28	
WK4GAQ	10	
WK4GCN	182	.2
WK4GDR	668	.7
WK4GD3	0	
WK4GED	322	.3
WK4GEH	210	.2
WK4GEJ	752	.8
WK4GEL	312	.3
WK4GEM	240	.3
WK4GEN	0	
WK4GEP	180	.2
WK4GES	180	.2
WK4GET	14,496	15.1
WK4GFK	8,373	8.8
WK4GFT	0	
WK4GF2	42	
WK4RCV	161	.2
TOTAL	95,927	

Surface Material Received Adjusted for ALOC

by Consignee for Orange Route

Consignee	Volume Received Cu. Ft.	%
WK4EX6	1,152	.8
WK4EYF	52,319	35.0
WK4FV6	806	.5
WK4FXZ	0	
WK4FX4	2,210	1.5
WK4FYS	36,151	24.2
WK4FZB	321	.2
WK4FZC	665	.4
WK4FZD	1,070	.7
WK4FZL	1,485	1.0
WK4FZN	1,006	.7
WK4FZV	4,026	2.7
WK4FZ1	350	.2
WK4F33	0	
WK4GCL	32	
WK4GC3	0	
WK4GC7	0	
WK4GC9	248	.2
WK4GDB	0	
WK4GDC	13,031	8.7
WK4GDD	498	.3
WK4GDK	28,905	19.4
WK4GDL	0	
WK4GFY	1,962	1.3
WK4POQ	30	
WK4QPU	10	
WK4R30	2,182	1.5
WK4TUJ	228	.1
WK4UUA	784	.5
TOTAL	149,471	

Surface Material Received Adjusted for ALOC
by Consignee for Red Route A

Consignee	Volume Received Cu. Ft.	%
WK4EYD	391	.8
WK4FRW	5	
WK4F3N	450	1.0
WK4F3Z	1,781	3.8
WK4F80	82	.2
WK4F81	126	.3
WK4GEK	140	.3
WK4GE0	110	.2
WK4GE1	6	
WK4GE2	20,702	43.7
WK4GE3	44	
WK4GE4	586	1.2
WK4GE7	14,661	31.0
WK4GFE	0	
WK4GF1	8,229	17.4
WK4GF6	28	
TOTAL	47,341	

Surface Material Received Adjusted for ALOC

by Consignee for Brown Route

Consignee	Volume Received Cu. Ft.	%
WK4EX4	2,674	1.0
WK4EYE	0	
WK4EYJ	89,618	34.9
WK4FR5	0	
WK4FV2	3,920	1.5
WK4FV9	24,276	9.5
WK4FWL	10	
WK4FW2	230	.1
WK4FW5	3,791	1.5
WK4F1A	2,359	.9
WK4F30	0	
WK4F83	12,872	5.0
WK4F88	48	
WK4GA1	7,471	2.9
WK4GA3	682	.3
WK4GA5	202	.1
WK4GBV	5,545	2.2
WK4GBW	66,963	26.1
WK4GBY	162	
WK4GBZ	148	
WK4GB0	6,776	2.6
WK4GB3	148	
WK4GB6	18,603	7.2
WK4GCB	3,170	.5
WK4GD8	254	.1
WK4GFC	2,794	1.1
WK4GFX	132	
WK4GGD	231	.1
WK4SGA	4,715	1.8
WK4UUB	900	.4
WK46B6	0	
TOTAL	258,694	

Surface Material Received Adjusted for ALOC
by Consignee for Isolated Route C

Consignee	Volume Received Cu. Ft.	%
WK4F87	56	46.6
WK4GDT	64	53.3
TOTAL	120	

Surface Material Received Adjusted for ALOC
by Consignee for Isolated Route D

Consignee	Volume Received Cu. Ft.	%
WK3FQT		
WK3FQU		
WK3FQ3		

Surface Material Received Adjusted for ALOC
by Consignee for Unknown Route

Consignee	Volume Received Cu. Ft.	%
WKOFPV		
WK2FP7		
WK9GG9	13,143	39.5
WK9GHK	15,824	47.5
WM1Q7C	642	1.9
WN7GX8	3,681	11.1
TOTAL	33,290	

Appendix C

SURFACE VOLUME RECEIVED BY MONTH

CONSIGNEES RECOMMENDED FOR AIR SHIPMENTS

Surface Volume 1976
Cluster 1 Green Route A

Consignee	Air Ship	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov
WK4EX5		59	88		313	669			3361	12930	1748
WK4FRH	R	---	---		3	---			---	---	---
WK4FT7		1015	1470		700	792			3778	1602	7411
WK4FUG		29011	53894		36401	106682			41936	108363	40007
WK4FYO	A	130	923		218	120			179	1854	158
WK4FY3	A	14269	9527		12868	9196			2134	14151	6086
WK4F2G	R	---	---		---	---			---	---	---
WK4F2J	R	20	---		---	---			---	---	---
WK4F2L	A	746	824		520	492			4	3677	10
WK4F32	A	440	845		933	303			64	153	327
WK4F8V	A	1565	2092		910	1862			1456	5097	1253
WK4GC1	A	9	137		11	38			155	276	59
WK4GC2	A	1505	2235		1282	1547			3101	8379	1528
WK4GC5	A	148	145		148	116			143	435	---
WK4GC6	A	77	177		130	94			103	915	1
WK4GDP	A	---	---		---	---			1	12	9
WK4GEA	A	65	72		3	4			96	33	2
WK4GFL		1420	875		579	382			398	1131	180
WK4GFS		553	721		2302	570			522	1686	320
WK4GFO		827	974		796	1405			642	3762	127
WK4NP7	A	3465	6245		2088	2324			20867	44874	12118
WK4SF6	R	5	54		12	---			---	24	---
WK4SRQ		---	---		26266	8490			1709	19074	964
WK4SRR	A	---	---		1139	7131			637	8688	621
WK4UT9		---	---		---	---			464	1374	412
TOTAL		55329	81298		87622	142217			81750	238490	73341

A = ALOC Unit
R = Recommended for Air Shipments

Surface Volume 1976
Cluster 2 Red Route B

Consignee	Air Ship	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov
WK4EX9		90	96		549	194			801	3078	250
WK4FRD	R	---	---		---	46			---	---	5
WK4FSA	R	5	30		---	---			29	---	---
WK4FOQ		646	1721		215	2263			2762	1947	1673
WK4FOT		812	1715		297	1020			1612	11139	4396
WK4FOV		12166	18786		14910	33929			14152	21756	9597
WK4FO4	R	---	12		12	---			36	171	---
WK4F8S	A	---	2		67	3			7	180	75
WK4F8T	A	483	324		779	574			724	1455	276
WK4F9A	A	1092	10958		777	1335			1360	4047	808
WK4F9C		8682	8400		9859	8147			6527	19911	3307
WK4GDV	A	488	355		384	421			282	2664	469
WK4GDW		4390	7476		6450	10010			6465	20964	4917
WK4GDX	A	816	940		794	1740			1832	2943	502
WK4GDY	A	88	158		272	1216			112	309	59
WK4GD1	R	11	---		---	9			---	720	---
WK4GD2	A	3485	2462		1979	2742			3461	5286	2286
WK4GD4	R	---	17		3	60			7	---	---
WK4GD5	A	1149	857		1485	1414			4069	4497	116
WK4GEV	A	10316	6592		10521	8575			9071	15291	6456
WK4GEW	A	78	47		115	142			2148	174	22
WK4GFJ		1244	967		1591	319			2896	2091	1330
WK4GFR		1124	1302		3659	1118			1706	1914	1160
WK4GFZ		1621	2248		3828	570			1815	7761	2606
WK4GF3	A	328	102		307	139			228	363	93
TOTAL		49114	65567		58853	75986			62102	128661	40403

A = ALOC Unit
R = Recommended for Air Shipments

AD-A040 423 EVALUATION RESEARCH CORP FALLS CHURCH VA F/G 15/5
STUDY TO ANALYZE NEW CUMBERLAND ARMY DEPOT'S CONSOLIDATION AND --ETC(U)
APR 77 J A SCANGA, E P SCHNEIDER DAAG36-76-C-0105

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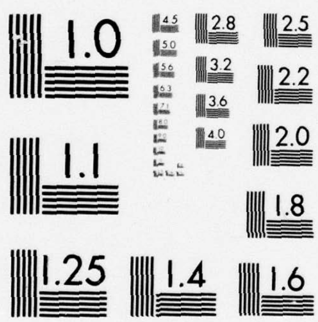

MICROCOPY RESOLUTION TEST CHART
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Surface Volume 1976
Cluster 3 Purple Route

Consignee	Air Ship	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov
WK4EYA		10	---		2795	---			828	---	---
WK4FRK		683	2432		595	2195			2232	7887	1754
WK4FRQ		3550	1850		758	695			4190	3687	1132
WK4FR8	R	---	---		---	---			---	---	---
WK4FU2	R	---	---		---	---			---	---	---
WK4FZ4		15759	11680		27166	16226			13938	22536	14772
WK4FZ9	R	---	---		---	8			---	15	---
WK4F3E	R	---	---		---	---			---	---	---
WK4F8W		5115	4542		4917	3254			3426	15210	3056
WK4GCP	A	220	328		66	215			290	627	69
WK4GC4	A	295	703		105	43			266	210	45
WK4GDU	A	2282	4289		2171	4243			4712	8220	2067
WK4GFD		781	836		148	698			594	564	883
WK4GFU		1299	923		1604	976			930	2922	1339
TOTAL		29994	27583		40325	28553			31406	61878	25117

A = ALOC Unit
R = Recommended for Air Shipments

Surface Volume 1976
Cluster 4 Green Route B

Consignee	Air Ship	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov
WK4CJR	A	---	49		29	36			170	1887	128
WK4EX7		---	---		---	240			5	870	294
WK4F9R	A	52	54		32	163			271	261	34
WK4F9T	A	789	263		6652	1705			2174	10644	2165
WK4F9V	A	483	237		709	1774			276	885	291
WK4F9X		7314	8627		12048	17303			10629	42084	6045
WK4F9Z	A	2797	1857		2973	4033			3997	10341	764
WK4F90	A	770	1278		2837	1858			856	3930	690
WK4F91	A	4540	7928		6755	6855			7340	32466	6428
WK4F93	A	104	20		42	2			297	1134	102
WK4F94	A	---	---		---	---			6	2643	---
WK4F95	A	107	226		96	81			131	216	76
WK4F96		5088	6873		17763	19832			5276	16971	807
WK4GAB	A	1520	732		1127	3017			1753	6783	1556
WK4GDS		---	3		---	94			80	13095	1822
WK4GFN		2642	3272		1646	2198			1088	6342	445
TOTAL		26206	31419		52709	59191			34349	150552	21647

A = ALOC Unit
R = Recommended for Air Shipments

Surface Volume 1976
Cluster 5 Yellow Route

Consignee	Air Ship	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov
WK4EYC		72	78		262	301			657	4200	764
WK4FRZ	R	---	11		7	10			1	84	8
WK4FUU		7710	9554		6270	9446			4563	21339	8197
WK4FUZ	R	---	---		---	---			114	---	---
WK4FVK		5668	5184		4278	4998			8050	11526	4806
WK4F98	A	2501	4047		2038	2097			2312	7779	1429
WK4GAA	A	1365	2722		1758	2150			917	4365	704
WK4GAC		5502	6607		4883	5624			5109	27210	7911
WK4GAD		1	11		438	1054			20	249	13
WK4GAE		603	3182		707	2104			4371	14628	4414
WK4GAH	R	---	---		---	---			---	---	---
WK4GAK	A	278	5		12	92			41	240	350
WK4GAL	A	5	14		75	9			57	123	20
WK4GA2	A	940	745		462	587			868	2490	526
WK4GFA		628	799		81	165			609	573	291
WK4GFP		1103	3439		872	1728			1892	2004	729
WK4GFQ		870	1276		238	206			552	1284	698
TOTAL		27246	37674		22381	30571			30133	98094	30860

A = ALOC Unit

Surface Volume 1976
Cluster 6 Isolated Route A

Consignee	Air Ship	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov
WK4FSE		7	---		287	1349			591	4863	978
WK4F8Q	A	10386	25554		25666	34722			12301	33147	7255
WK4F85	A	74	21		167	62			40	2037	373
WK4GFH		745	1566		2439	3951			2142	8553	3833
WK4SN8	A	2967	3125		2488	4556			1911	7251	1292
WK4SN9	A	474	197		428	331			749	1359	399
TOTAL		14653	30463		31475	44971			17734	57210	14130

A = ALOC Unit
R = Recommended for Air Shipments

Surface Volume 1976
Cluster 7 Isolated Route B

Consignee	Air Ship	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov
WK4FSR		2560	4845		5250	5875			4476	15342	6089
WK4FTK		434	419		280	297			206	2076	767
WK4FTN		4564	4292		3864	16855			4025	10341	5600
WK4F2A		254	254		153	542			395	660	497
WK4F42		210	---		---	---			390	1872	571
WK4JLA	R	---	---		---	---			---	---	---
TOTAL		8022	9810		9547	23569			9492	30291	13524

A = ALOC Unit
R = Recommended for Air Shipments

Surface Volume 1976
Cluster 8 Blue Route

Consignee	Air Ship	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov
WK4EX8		66	86		162	202			305	14958	2432
WK4F2V	R	---	---		---	---			---	---	---
WK4F2Y	R	---	---		---	---			---	---	---
WK4F22	R	---	---		---	---			---	---	---
WK4F22		1114	2503		1842	739			2511	4890	6181
WK4F25		---	11		537	976			1941	5622	1815
WK4F27	R	---	---		---	---			---	---	---
WK4F3K		10278	15902		15541	38397			16987	46785	20657
WK4F8Y		178	625		269	278			1423	426	219
WK4GAM	A	---	---		2	7			1	663	3
WK4GAQ	A	2302	2207		2509	2811			1295	5625	636
WK4GCN	A	259	43		6	78			11	1164	7
WK4GDR	A	1674	2958		1710	2216			1332	5157	1173
WK4GD3	R	---	---		---	---			---	---	---
WK4GED	A	---	---		---	52			49	39	31
WK4GEH	A	437	419		450	513			495	1998	168
WK4GEJ	A	1675	2043		1264	13152			---	4155	---
WK4GEL	A	27	9		1350	1060			1884	4032	183
WK4GEM	A	492	796		1602	930			1035	4989	686
WK4GEN	A	2415	1912		2282	2189			2815	9153	1108
WK4GEP	A	2366	4561		1750	2265			3078	3411	1157
WK4GES		2304	1237		1374	2233			---	18	---
WK4GET		5161	6338		9399	10744			8061	18150	8294
WK4GFK		1867	1953		2219	4008			3294	7503	1738
WK4GFT	R	30	---		---	---			---	---	---
WK4GF2	A	293	686		146	1917			1	---	10
WK4RCV		1363	2799		994	429			6	198	---
TOTAL		34301	47088		45408	85196			46524	138936	46498

A = ALOC Unit
R = Recommended for Air Shipments

Surface Volume 1976
Cluster 9 Orange Route

Consignee	Air Ship	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov
WK4EX6		138	539		635	725			437	3945	961
WK4EYF		16335	17317		13657	35974			17673	76299	24795
WK4FV6		4044	3415		1444	2813			17673	76299	24795
WK4FXZ	A	451	818		955	372			---	144	3
WK4FX4		7102	3418		3446	51			69	2808	22
WK4FYS		28049	1259		5909	9692			7700	18990	1432
WK4FZB	R	---	181		198	56			23	27	157
WK4FZC		719	1075		597	450			108	834	163
WK4FZD		124	202		111	4			1194	30828	---
WK4FZL		1781	132		150	845			---	735	10
WK4FZN	A	1212	765		567	1219			1599	3782	781
WK4FZV		---	---		60	379			7893	6132	4170
WK4FZ1		199	1154		917	753			433	2769	485
WK4F33	A	1052	538		1208	281			56	798	44
WK4GCL	A	828	2849		1479	1388			612	3054	193
WK4GC3	R	---	---		---	---			---	---	---
WK4GC7	R	---	---		---	---			---	---	---
WK4GC9	A	919	1415		308	163			190	1797	147
WK4GDB	R	---	---		---	---			---	---	---
WK4GDC		3351	3713		2081	5328			3316	16755	3448
WK4GDD	A	4486	4559		1241	4847			1907	8631	1428
WK4GDK		17520	13487		8142	21592			30150	44736	11387
WK4GDL	R	---	---		---	---			---	---	---
WK4GFY		1719	4971		4024	2665			6821	29379	7035
WK4POQ	A	105	168		481	240			265	126	44
WK4QPU	R	---	1		---	166			6	87	14
WK4R30	A	2425	5176		8076	4672			2331	26199	4699
WK4TUJ	A	---	---		---	---			168	---	---
WK4UUA		348	3		403	78			546	1272	319
TOTAL		92907	67154		56089	94753			84185	284159	61867

A = ALOC Unit
R = Recommended for Air Shipments

Surface Volume 1976
Cluster 10 Red Route A

Consignee	Air Ship	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov
WK4EYD		---	150		180	48			102	3288	828
WK4FRW	R	76	33		14	---			---	---	---
WK4F3N		---	1255		---	8			---	1917	30
WK4F3Z		548	1112		235	1872			624	4299	902
WK4F80	A	42	---		1	45			41	147	48
WK4F81	A	603	862		629	166			753	6354	194
WK4GEK	A	---	---		8	298			73	2382	202
WK4GEO	A	7	3		49	112			57	150	15
WK4GE1	A	161	36		12	42			141	117	6
WK4GE2		4776	8664		4231	8121			3980	13737	3243
WK4GE3	A	291	513		523	482			365	1197	1608
WK4GE4	A	7468	10605		8467	9701			5757	30087	3280
WK4GE7		7410	7264		6932	5665			1986	24837	2303
WK4GFE	R	---	---		---	---			---	---	---
WK4GF1		2652	1004		4080	2558			1849	7752	4183
WK4GF6	A	61	267		70	83			147	627	30
TOTAL		24095	31768		25431	29201			15875	96891	16873

A = ALOC Unit
R = Recommended for Air Shipments

Surface Volume 1976
Cluster 11 Brown Route

Consignee	Air Ship	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov
WK4EX4		120	282		240	1137			571	7794	863
WK4EYE	R	22	---		2	---			---	---	---
WK4EYJ		24043	40706		24060	45411			34194	107556	22622
WK4FR5	R	---	---		---	---			---	---	---
WK4FV2		448	2136		486	1406			1907	8847	9152
WK4FV9		10189	16445		7443	20840			17855	36189	19993
WK4FWL	A	126	3408		---	---			---	---	---
WK4FW2	R	---	---		246	763			652	3714	131
WK4FW5		2395	4038		1637	2657			4227	17391	6172
WK4F1A		2106	2264		1064	1571			2258	5820	2432
WK4F30	A	930	821		515	343			10	231	89
WK4F83		7864	6286		8956	8556			2664	14001	3345
WK4F88	A	135	33		2	106			13	42	38
WK4GA1		1583	2122		1289	1186			3856	18234	1790
WK4GA3	A	5676	9269		6024	8963			6246	25285	5091
WK4GA5	A	44	28		---	526			23	672	107
WK4GBV		17539	24417		34979	25578			8898	13548	7040
WK4GBW		---	---		891	6547			26666	39558	19184
WK4GBY	A	4149	2542		1545	2512			1390	5709	2105
WK4GBZ	A	1271	3870		1517	992			1324	3774	1030
WK4GBO		5	88		5	1407			2319	13389	1766
WK4GB3		108	2064		4962	142			768	1434	825
WK4GB6		5998	3647		4551	4150			4108	21675	3116
WK4GCB	A	81	39		---	3			198	417	225
WK4GD8	A	43	18		73	198			---	351	412
WK4GFC		745	1726		859	---			880	3948	720
WK4GFX		2392	3838		3539	1491			---	---	---
WK4GGD	R	---	7		---	119			14	120	140
WK4SGA		---	---		---	---			3985	7218	1318
WK4UUB		---	---		---	---			281	1170	470
WK46B6	A	---	---		---	---			---	---	---
TOTAL		88012	130094		104885	136604			125101	358087	110176

A = ALOC Unit
R = Recommended for Air Shipments

Surface Volume 1976
Cluster 12 Isolated Route C

Consignee	Air Ship	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov
WK4F87	A	4	6		3	2			---	105	3
WK4GDT	A	99	3		22	27			5	204	22
TOTAL		103	9		25	29			5	309	25

A = ALOC Unit
R = Recommended for Air Shipments

Surface Volume 1976
Cluster 13 Isolated Route D

Consignee	Air Ship	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov
WK3FQT		1781	1715		2893	1834			2904	11349	3841
WK3FQU		37	443		5	39			4	---	1
WK3FQ3		1008	7592		3581	6124			6026	12795	3801
TOTAL		2826	9750		6479	7997			8934	24144	7643

A = ALOC Unit
R = Recommended for Air Shipments

Surface Volume 1976
Unknown Cluster

Consignee	Air Ship	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov
WK0FPV	R	130	---		8	2			---	123	78
WK2FP7		1916	1544		1253	1902			2268	8577	1816
WK9GG9		3505	1833		2103	2621			2580	12744	3459
WK9GHK		4365	23442		6065	14934			6665	61236	5025
WM1Q7C	R	---	24		48	49			1	108	129
WN7GX8		6115	2326		---	1338			---	9105	7056
TOTAL		16031	29169		9447	20846			11514	91893	17563

A = ALOC Unit
R = Recommended for Air Shipments

Appendix D

VAN LOADING SIMULATION MODEL

Program Listing

```
      INTEGER*2 IU(1000),IVOL(1000),IMH(1000),IWT(1000),MUST(1000)
      COMMON MAX(3),MIN(3),NPUSE(3),MOPT(3),IAL(3),MREM(3),MWT(3),
     *LOAD(3),NDU(3),INT(99,4),LIST(127,4),MORD(127),MAMT(127),NODIT(127
     *),MWAT(127),NTX4,KF(3)
     *,NTYV(3),MREMT(3),MTOTW(3),MTOTV(3),IU(3,7),IU,IVOL,IMH,IWT,MUST
      DIMENSION ISTR(4,3)
      CALL CLR(INT,396,1)
      READ100,MHI,NINT,(MIN(J),MOPT(J),MAX(J),KF(J),NPUSE(J),J=1,3),INT(
     *1,1),K,L1
      IF(L1.EQ.0)GOTO173
      KK=2
      JJ=INT(1,1)
      DO174 I=JJ,NINT,7
  100 FORMAT(A4,19I4)
      INT(KK,1)=I+1
      INT(KK+1,1)=I+2
      INT(KK+2,1)=I+4
  174 KK=KK+3
      NINT=KK
  173 INT(NINT+1,1)=K
      INT(NINT+2,1)=K
      IF(L1.NE.0)GOTO172
      DO171I=2,NINT
  171 READ1700,(INT(I,J),J=1,4)
 1700 FORMAT(I5,1X,3I1)
  172 READ(1,400,ERR=172)K1,K2,JWT,IVL,IRECD,IHOLD
      IF(IRECD.LT.INT(1,1))GOTO172
  400 FORMAT(T47,2A3,T72,I5,I4,2X,I3,2X,I3)
      NTX4=0
      N=1
      MM=2
    1 READ(5,200,END=2)LIST(N,1),LIST(N,2),LIST(MM,1),LIST(MM,2)
  200 FORMAT(4A3)
      MORD(N)=N
      MORD(MM)=MM
      MM=MM+2
      N=N+2
      GOTO1
    2 N=N-1
      M=N
    6 MM=0
      DO3 J=2,M
      J1=MORD(J-1)
      J2=MORD(J)
      IF(LIST(J1,1)-LIST(J2,1))3,4,5
    4 IF(LIST(J1,2)-LIST(J2,2))3,3,5
    5 MORD(J-1)=J2
      MORD(J)=J1
      MM=J
    3 CONTINUE
      IF(MM.LE.2)GOTO7
      M=MM-1
      GOTO6
    7 DO8I=1,N
      J1=MORD(I)
    8 PRINT 300,I,(LIST(J1,J),J=1,4)
      DO41 I=N,126
      MORD(I+1)=127
   41 LIST(I+1,1)=MHI
      DO42 I=1,N,2
      LIST(I,3)=I
```

```
   42 LIST(I+1,3)=I
      CALLCLR(IU,21,0)
  300 FORMAT(I5,1X,2A3,3X,2A3)
      DO999IJK=2,NINT
      DO11J=1,3
      K=4-J
      IAL(J)=INT(IJK,J+1)
      IAL(K)=INT(IJK,K+1)
      IF(IAL(J).EQ.1)MAXV=J
      IF(IAL(K).EQ.1)MINV=K
C     IF(IJK.LF.2)GOTO1812
C     ISTR(1,J)=LOAD(J)
C     ISTR(2,J)=NDU(J)
C     ISTR(4,J)=MREM(J)
C     ISTR(3,J)=MWT(J)
 1812 LOAD(J)=0
      NDU(J)=0
      MWT(J)=0
      MREM(J)=MAX(J)
   11 CONTINUE
      I1=INT(IJK-1,1)+1
      I2=INT(IJK,1)
   12 CALL LOOK(K1,K2,JJ)
      IF(JJ.EQ.0)GOTO13
      NTX4=NTX4+1
      IU(NTX4)=JJ
      IVOL(NTX4)=IVL
      IMH(NTX4)=IHOLD
      IWT(NTX4)=JWT
      MUST(NTX4)=0
 4000 FORMAT(I5,5I8,1X,2A3)
      IF(IHOLD.LE.INT(IJK+1,1))MUST(NTX4)=1
      IF(IJK.GT.2)GOTO13
      PRINT4000,NTX4,JJ,IVL,JWT,MUST(NTX4),IHOLD,K1,K2
   13 READ(1,400,END=98,ERR=13)K1,K2,JWT,IVL,IRECD,IHOLD
      IF(JWT.LT.0)JWT=-JWT
      IF(IVL.LT.0)IVL=-IVL
      IF(IRECD.LE.I2)GOTO12
   15 CALL CLR(MAMT,N,0)
      CALL CLR(MWAT,N,0)
      CALL CLR(NODIT,N,0)
      CALL CLR(NTYV,12,0)
      DO14I=1,NTX4
      J=IU(I)
      IF(J.EQ.0)GOTO14
      MAMT(J)=MAMT(J)+IVOL(I)
      MWAT(J)=MWAT(J)+IWT(I)
      NODIT(J)=NODIT(J)+1
   14 CONTINUE
      PRINT1000,I1,I2,NTX4,IAL
      DO1819 J=1,N
      IF(NODIT(J).GT.0)PRINT1200,J,LIST(J,1),LIST(J,2),MAMT(J),MWAT(J),N
     *ODIT(J)
 1819 CONTINUE
 1200 FORMAT(I4,1X,2A3,3I8)
 1000 FORMAT(6I6/255(I4,1X,2A3,3I5/))
      DO791 I=1,N
  794 IF(MWAT(I).LE.42000)GOTO791
      IW=0
      LL=0
      JM=0
```

```
  792 IND=0
      MAW=0
      DO793 J=1,NTX4
      IF(IU(J).NE.I)GOTO793
      IF(MUST(J).LT.0)GOTO793
      IF(IWT(J).LE.MAW)GOTO793
      IF((IW+IWT(J)).GT.42000)GOTO793
      IF((JM+IVOL(J)).GT.MAX(MAXV))GOTO793
      IND=J
      MAW=IWT(J)
  793 CONTINUE
      IF(IND.EQ.0)GOTO795
      IW=IW+IWT(IND)
      JM=JM+IVOL(IND)
      IVOL(IND)=0
      MUST(IND)=-1
      IWT(IND)=0
      LL=LL+1
      GOTO792
  795 IF(IW.EQ.0)GOTO791
      CALL UPD(MAXV,JM,IW,-2)
      MWAT(I)=MWAT(I)-IW
      MAMT(I)=MAMT(I)-JM
      NODIT(I)=NODIT(I)-LL
      GOTO794
  791 CONTINUE
  201 DO202J=1,N
      IF(MAMT(J).LE.0)GOTO202
      JM=MAMT(J)
      IF(JM.GT.MAX(MAXV))GOTO203
      DO204K=MINV,MAXV
      IF(JM.LT.MOPT(K))GOTO202
      IF(JM.LE.MAX(K))GOTO2031
  204 CONTINUE
  202 CONTINUE
      GOTO2171
  203 ISHIP=MAX(MAXV)
      IW=MAXV
      CALL SHIP(J,ISHIP,IW,2)
      PRINT2030,MAXV,J,ISHIP,IW
 2030 FORMAT(' *SHIPPED SINGLE VAN TYPE ',I2,', USER ',I3,2I6)
      CALL UPD(MAXV,ISHIP,IW,-1)
      GOTO201
 2031 IW=K
      CALL SHIP(J,JM,IW,2)
      PRINT2030,K,J,JM,IW
      CALL UPD(K,JM,IW,-1)
      GOTO201
 2171 CONTINUE
C     DO2118 I=1,3
C     LOAD(I)=ISTR(1,I)
C     NDU(I)=ISTR(2,I)
C     MWT(I)=ISTR(3,I)
C2118 MREM(I)=ISTR(4,I)
  211 IB=0
      IPM=99999
      JB=0
      DO219 I=1,N
      JM=MAMT(I)
      JW=42000-MWAT(I)
      IF(JM.LE.0)GOTO219
```

```
      DO218K=MINV,MAXV
      IF(IAL(K).EQ.0)GOTO218
      JD=MREM(K)-JM
      IF(JD.LT.0)GOTO218
      IF(JD.GT.IPM)GOTO218
      IF(MWT(K).LE.JW)GOTO2166
      GOTO218
 2166 CONTINUE
      IF(NDU(K)-NPUSE(K)+1)217,216,216
  216 IF((LOAD(K)+JM).LT.MIN(K))GOTO218
  217 IPM=JD
      IB=I
      JB=K
  218 CONTINUE
  219 CONTINUE
      IF(IB.EQ.0)GOTO2312
      JM=MAMT(IB)
      IW=JB
      CALL SHIP(IB,JM,IW,2)
      CALL UPD(JB,JM,IW,IB)
      GOTO211
 2312 DO2313I=1,N
      IF(MAMT(I).EQ.0)GOTO2313
      KK=0
      LL=0
      JJ=0
      DO2314J=1,NTX4
      IF(IU(J).NE.I)GOTO2314
      IF(MUST(J).NE.1)GOTO2314
      LL=LL+1
      KK=KK+IWT(J)
      JJ=JJ+IVOL(J)
 2314 CONTINUE
      MAMT(I)=JJ
      MWAT(I)=KK
      NODIT(I)=LL
 2313 CONTINUE
  231 IB=0
      JB=0
      IPM=99999
      IF(IAL(1)+IAL(2)+IAL(3))239,239,234
  234 DO232I=1,N
      IF(MAMT(I).EQ.0)GOTO232
      JM=MAMT(I)
      JW=42000-MWAT(I)
      DO233K=MINV,MAXV
      IF(IAL(K).EQ.0)GOTO233
      JD=MREM(K)-JM
      IF(JD.LT.0)GOTO233
      IF(JD.GT.IPM)GOTO233
      IF(MWT(K).LE.JW)GOTO235
      GOTO233
  235 IPM=JD
      IB=I
      JB=K
  233 CONTINUE
  232 CONTINUE
      IF(IB.EQ.0)GOTO241
      JM=MAMT(IB)
      IW=JB
      CALL SHIP(IB,JM,IW,1)
```

```
      CALL UPD(JB,JM,IW,IB)
       IF(NDU(JB).EQ.0)IAL(JB)=0
      GOTO231
  241 DO242J=MINV,MAXV
      IF(IAL(J).NE.0)PRINT1250,J,NDU(J),LOAD(J),MREM(J)
 1250 FORMAT(' CLOSE VAN TYPE ',I2,3I6)
      IF(NDU(J).NE.0)CALL UPD(J,0,0,-1)
  242 CONTINUE
  239 DO238I=1,N
      IF(MAMT(I).EQ.0)GOTO238
      PRINT1300,I,MAMT(I)
 1300 FORMAT(' A&T -- ',I3,I5)
  238 CONTINUE
      MM=0
      DO2411 I=1,NTX4
      IF(MUST(I).NE.0)GOTO2411
      IF(IVOL(I).LE.0)GOTO2411
      MM=MM+1
      IVOL(MM)=IVOL(I)
      IU(MM)=IU(I)
      IMH(MM)=IU(I)
      IWT(MM)=IWT(I)
      MUST(MM)=0
      IF(IMH(MM).LT.INT(IJK+2,1))MUST(MM)=1
 2411 CONTINUE
      NTX4=MM
             IF(IEND.NE.1234)GOTO999
       GOTO1712
   98 IEND=1234
      IRECD=99999
      GOTO15
  999 PRINT5000,(J,NTYV(J),MTOTV(J),MTOTW(J),MREMT(J),MIN(J)
     *,MOPT(J),MAX(J),J=1,3)
 1712 IEND=0
      REWIND1
 5000 FORMAT('0INTERVAL SMRY ',/,3(I2,7I8,/))
      PRINT6000,IQ
      IF(LIST(N+1,3).NE.LIST(N+1,2))GOTO172
 6000 FORMAT('1END',7(3I7/))
      END
      SUBROUTINE UPD(JB,JM,IW,IB)
      INTEGER*2 IU(1000),IVOL(1000),IMH(1000),IWT(1000),MUST(1000)
      COMMON MAX(3),MIN(3),NPUSE(3),MOPT(3),IAL(3),MREM(3),MWT(3),
     *LOAD(3),NDU(3),INT(99,4),LIST(127,4),MORD(127),MAMT(127),NODIT(12
     *),MWAT(127),NTX4,KF(3)
     *,NTYV(3),MREMT(3),MTOTW(3),MTOTV(3),IQ(3,7),IU,IVOL,IMH,IWT,MUST
      LOAD(JB)=LOAD(JB)+JM
      MREM(JB)=MAX(JB)-LOAD(JB)
      MWT(JB)=MWT(JB)+IW
      IF(JM.NE.0)NDU(JB)=NDU(JB)+1
      IF(IB.LE.0)GOTO7
      PRINT700,JB,NDU(JB),IW,JM,LIST(IB,1),LIST(IB,2),MREM(JB)
      IF(NDU(JB).GE.NPUSE(JB))GOTO7
  700 FORMAT(' VAN TYPE ',I2,', CUST # ',I3,2I6,1X,2A3,I6)
      IF(MREM(JB).GT.KF(JB))RETURN
    7 I2=JB
      IF(JB.EQ.1)GOTO77
      I1=JB-1
      DO 78 I2=1,I1
      IF(IAL(I2).EQ.1.AND.LOAD(JB).LE.MAX(I2))GOTO79
   78 CONTINUE
```

```
      I2=JB
      GOTO77
   79 PRINT80,JB,I2
   80 FORMAT(' PREV XNS FOR TYPE',I2,' APPLIED TO TYPE',I2)
   77 PRINT800,I2,LOAD(JB),NDU(JB),MWT(JB),MREM(JB)
      GOTO1901
  800 FORMAT('0SHIP VAN TYPE ',I2,4I8)
 1857 NTYV(I2)=NTYV(I2)+1
      MTOTV(I2)=MTOTV(I2)+LOAD(JB)
      MREMT(I2)=MREMT(I2)+MAX(I2)-LOAD(JB)
      NDU(JB)=0
      MTOTW(I2)=MTOTW(I2)+MWT(JB)
      MWT(JB)=0
      LOAD(JB)=0
      MREM(JB)=MAX(JB)
    9 RETURN
 1901 I=I2
      J=NDU(JB)
      IPC=100
      IF(IB.NE.-2)IPC=100*LOAD(JB)/MAX(I2)
      IQ(I,1)=IQ(I,1)+1
      IQ(I,2)=IQ(I,2)+IPC
      IQ(I,J+2)=IQ(I,J+2)+1
      GOTO1857
      END
      SUBROUTINE CLR(M,N,L)
      DIMENSION M(1)
      DO1I=1,N
    1 M(I)=L
      RETURN
      END
      SUBROUTINE SHIP(IB,JM,IW,IGO)
      INTEGER*2 IU(1000),IVOL(1000),IMH(1000),IWT(1000),MUST(1000)
      COMMON MAX(3),MIN(3),NPUSE(3),MOPT(3),IAL(3),MREM(3),MWT(3),
     *LOAD(3),NDU(3),INT(99,4),LIST(127,4),MORD(127),MAMT(127),NODIT(127
     *),MWAT(127),NTX4,KF(3)
     *,NTYV(3),MREMT(3),MTOTW(3),MTOTV(3),IQ(3,7),IU,IVOL,IMH,IWT,MUST
      LL=0
      MAXW=42000-MWT(IW)
      IW=0
      K=0
   14 DO19I=1,NTX4
      IF(IU(I).NE.IB)GOTO19
      IF(MUST(I).NE.1)GOTO19
      JJ=K+IVOL(I)
      IF(JJ.GT.JM)GOTO19
      IF((IW+IWT(I)).GT.MAXW)GOTO19
      K=JJ
      IW=IW+IWT(I)
      IVOL(I)=0
      MUST(I)=-1
      LL=LL+1
   19 CONTINUE
      IF(K.EQ.JM)GOTO29
      IF(IGO.NE.2)GOTO29
      DO27I=1,NTX4
      IF(IU(I).NE.IB)GOTO27
      IF(MUST(I).NE.0)GOTO27
      JJ=K+IVOL(I)
      IF((IW+IWT(I)).GT.MAXW)GOTO27
      IF(JJ-JM)26,26,27
```

```
   26 K=JJ
      IW=IW+IWT(I)
      IVOL(I)=0
      MUST(I)=-1
      LL=LL+1
           IF(JJ.EQ.JM)GOTO29
   27 CONTINUE
   29 JM=K
      NODIT(IB)=NODIT(IB)-LL
      MWAT(IB)=MWAT(IB)-IW
      MAMT(IB)=MAMT(IB)-JM
      IF(JM.NE.0)RETURN
      PRINT1000,(I,MAMT(I),MWAT(I),NODIT(I),I=1,127),IAL,MAX,MOPT,MIN,MR
     *EM,LOAD,NDU,MWT,IB,IW,IGO
 1000 FORMAT(' PROBLEM*********'/127(I4,3I9/),9(3I6/))
      RETURN
      END
      SUBROUTINE LOOK(K1,K2,JJ)
      COMMON MAX(3),MIN(3),NPUSE(3),MOPT(3),IAL(3),MREM(3),MWT(3),
     *LOAD(3),NDU(3),INT(99,4),LIST(127,4),MORD(127),MAMT(127),NODIT(127
     *),MWAT(127),NTX4,KF(3)
      DIMENSION MP(6)
      DATA MP/32,16,8,4,2,1/
      JJ=64
      DO9L=1,6
      II=MORD(JJ)
      IF(K1.LT.LIST(II,1))GOTO8
      IF(K1.GT.LIST(II,1))GOTO7
      IF(K2-LIST(II,2))8,10,7
    8 JJ=JJ-MP(L)
      GOTO9
    7 JJ=JJ+MP(L)
    9 CONTINUE
      II=MORD(JJ)
      IF(LIST(II,1).NE.K1.OR.LIST(II,2).NE.K2)GOTO11
   10 JJ=II
      RETURN
   11 JJ=0
      RETURN
      END
```

Appendix E

SCHEDULE OF SAILING DATES

AND

SCHEDULE OF BROWN ROUTE SAILINGS

SAILING SCHEDULE

8-1-76 - 10-9-76

Sail	Port	Vessel	TCN	Units
8/1	DUNDALK	YOUNG AMERICA	5412V601-602	2
8/3	TIOGA	AMER LEADER	5414V601-605	5
8/6	DUNDALK	AMER LEGEND	5436V601-627	27
8/7	DUNDALK	MARKET	5454V601-662	62
8/10	TIOGA	AMER ALLIANCE	5450V601-615	15
8/13	DUNDALK	AMER ACCORD	5437V601-630	30
8/14	DUNDALK	EXPORT FREEDOM	5437V601-631	31
8/14	DUNDALK	FORT GALLOWAY	5486V601-670	70
8/20	DUNDALK	AMER ARGOSY	5507V601-630	30
8/21	DUNDALK	RESOURCE	5491V601-692	92
8/21	DUNDALK	LIGHTING	5506V601-640	40
8/21	DUNDALK	DEFIANCE	5513V601	1
8/24	TIOGA	AMER LEGACY	5528V601-630	30
8/28	DUNDALK	MARKET	5492V601-708	108
8/28	DUNDALK	EXPORT PATRIOT	5514V601-625	25
8/31	TIOGA	AMER LEADER	5548V601-624	24
9/4	DUNDALK	GALLOWAY	5493V601-695	95
9/4	DUNDALK	EXPORT FREEDOM	5572V601	1
9/4	DUNDALK	AMER ALLIANCE	5591V601-635	35
9/10	DUNDALK	AMER ACCORD	5564V601-624	24
9/11	DUNDALK	RESOURCE	5566V601-675	75
9/11	DUNDALK	LIGHTING	5563V601-651	51
9/17	DUNDALK	AMER ARGOSY	5557V601-626	26
9/18	DUNDALK	MARKET	5650V601-701	101
9/18	DUNDALK	RED JACKET	5667V601-602	2

SAILING SCHEDULE (Continued)

8-1-76 - 10-9-76

Sail	Port	Vessel	TCN	Units
9/21	TIOGA	AMER LEGACY	5652V601-625	25
9/24	DUNDALK	AMER ACE	5617V601-617	17
9/25	DUNDALK	EXPORT FREEDOM	5656V601-651	51
9/25	DUNDALK	GALLOWAY	5658V601-687	87
9/28	TIOGA	AMER LEADER	V601-618	18
10/2	DUNDALK	RESOURCE	5683V601-702	102
10/2	DUNDALK	LIGHTING	5696V601-650	50
10/3	DUNDALK	DEFIANCE	5706V601	1
10/9	DUNDALK	EXPORT PATRIOT	5701V601-609	9

BROWN ROUTE SAILINGS

Sail Date	Port	Vessel	Van #	Van Vol.	Date Shipped
8-7-76	Dundalk	Market	51059/35	1069	216
			51254/35	1383	217
8-10-76	Tioga	Alliance	24803/20	568	215
8-13-76	Dundalk	Accord	24948/20	716	219
			60231/20	758	225
			79315/20	695	224
8-14-76	Dundalk	Galloway	39846/35	1465	218
			50814/35	1106	218
			52468/35	1281	219
			60458/35	1397	223
			60953/35	1454	219
			63330/35	1403	218
			65203/35	1377	218
			70891/35	1602	217
8-14-76	Dundalk	Export Freedom	20381/20	559	222
			75392/40	1408	225
			75487/40	1170	223
			90705/40	1381	223
8-20-76	Dundalk	Argosy	01914/40	1576	225
			12734/40	1435	230
			95154/40	1598	227
			99739/40	1279	229
8-21-76	Dundalk	Lightning	22084/20	748	233
			25316/20	671	232
			27673/20	777	232
8-21-76	Dundalk	Resource	36548/35	1289	226
			39447/35	1143	231
			43452/35	1450	226
			46174/35	1453	224
			47373/35	681	230
			50006/35	815	229
			51799/	1092	229
			52278/35	1617	226
			59004/35	1534	229
			59115/35	1165	230
			65312/35	1114	230
			66985/35	1331	228
			72407/35	1429	225
			73909/35	1244	228

Sail Date	Port	Vessel	Van #	Van Vol.	Date Shipped
8-24-76	Tioga	Legacy	03517/40	1529	233
			10497/40	1163	231
			16664/40	1506	234
			19050/40	1656	234
8-28-76	Dundalk	Export Patriot	20484/20	555	237
			20675/20	643	237
			21876/20	884	238
8-28-76	Dundalk	Market	33521/35	1161	236
			34439/35	1479	236
			35274/35	1354	233
			36090/35	1477	237
			36293/35	1679	233
			37592/35	949	237
			38181/35	1182	239
			39786/35	1152	238
			41361/35	1548	239
			43258/35	1384	240
			54200/35	861	237
			54274/35	1269	237
			54359/35	1344	237
			55278/35	1050	239
			61538/35	1267	235
8-31-76	Tioga	Leader	02440/20	712	238
			68933/20	740	240
9-4-76	Dundalk	Galloway	02351/35	1944	241
			08236/35	1440	244
			08291/35	669	243
			35100/35	1646	246
			37991/35	972	244
			39954/35	1017	246
			41031/35	1123	246
			42629/35	1162	241
			55859/35	1471	243
			57708/35	2217	243
			59062/35	1284	241
			59368/35	2172	242
			62432/35	1250	245
9-7-76	Dundalk	Alliance	19072/40	1845	245
			54241/40	489	244
			58540/20	504	245
			91543/40	1681	245

Sail Date	Port	Vessel	Van #	Van Vol.	Date Shipped
9-10-76	Dundalk	Accord	08021/44	1744	251
			10114/40	1266	252
			19679/40	786	252
			22883/40	922	251
			92520/40	1210	252
9-11-76	Dundalk	Resource	37914/35	1043	252
			38906/35	1268	247
			47623/35	1388	253
			48263/35	1117	253
			50608/35	1173	252
			51299/35	1181	247
			53338/35	1287	248
			63279/35	1203	251
			66570/35	1156	247
			67918/35	1263	247
			69216/35	1378	252
9-11-76	Dundalk	Lightning	20497/20	573	255
			22253/20	660	246
			23064/20	582	246
			24950/20	566	245
			26413/24	737	248
9-21-76	Tioga	Legacy	21126/20	592	259
			62476/20	647	258
			74487/20	513	259
9-24-76	Dundalk	Ace	10690/40	1474	261
9-25-76	Dundalk	Freedom	21006/20	439	265
			25094/20	662	267
			5963/20	678	265
9-25-76	Dundalk	Galloway	04637/35	1201	264
			08061/35	1271	265
			35709/35	1181	266
			40550/35	1477	264
			43439/35	545	265
			44065/35	1117	263
			46105/35	1167	260
			47311/35	787	265
			47374/35	1584	261
			50961/35	1320	266
			53569/35	1262	266
			54708/35	1142	264
			55598/35	1320	266
			61309/35	1570	260
			64627/35	1282	260
			65078/35	1192	266
			65613/35	1568	266
			70436/35	1123	261
			71462/35	1097	264

Sail Date	Port	Vessel	Van #	Van Vol.	Date Shipped
9-28-76	Tioga	Leader	10790/20	630	269
			51322/20	706	269
10-2-76	Dundalk	Resource	01265/35	1320	267
			01470/35	1247	268
			02153/35	1423	268
			09474/35	1203	271
			35351/35	1320	267
			41578/35	1320	267
			42803/35	1161	268
			45097/35	1472	267
			50348/35	1487	273
			53148/35	1900	267
			56820/35	2400	267
			57375/35	1909	273
			60366/35	1382	272
			62146/35	1320	266
			62472/35	1031	268
			62705/35	1320	268
			70228/35	1383	271
			99212/35	949	271
			99322/35	1460	272
			99330/35	1104	271
10-2-76	Dundalk	Lightning	20188/20	771	268
			20350/20	551	271
			24241/20	507	272
			26363/20	538	273
			66044/20	720	267

Appendix F

REPORT ON VISITS TO TWO COMMERCIAL TRANSFER AND STORAGE COMPANIES

VISIT TO COMMERCIAL STORAGE AND TRANSFER COMPANIES

Visit to two commercial transfer facilities were undertaken in an attempt to provide a comparison for CCP operations. Although the two commercial organizations are profit-oriented and both are part of a larger group, they as the CCP, must receive, consolidate, load and deliver cargo.

The study team was interested in determining how the two commercial organizations operated: how goods were received, stored, consolidated and shipped. Additionally, the pilferage problem was discussed with representatives of each company.

Company A is an affiliate of ATLAS Van Lines, a worldwide mover of household goods. Company B provides rapid service between Washington, D.C., Richmond, Norfolk, Charlotte, Greensboro, Raleigh, Fayetteville and other cities in Eastern Virginia and North Carolina.

A comparison of the two companies with the CCP operation is difficult to make because of the nature and responsibilities of each organization. Figure   is an attempt to make this comparison.

Most of the material received for overseas shipment by Company A is packed in cartons at the customer's house. On those occasions when unpacked household goods are received, the company increases its staff of loaders and packers. Comparison of hold time is also difficult because customer goods may be stored for extended periods waiting for a house or apartment to be vacated, etc.

COMPANY A

Company A is a worldwide mover of household goods, a part of the ATLAS Van Line System. They are more aware of the consolidation problem that faces the CCP.

COMPARISON OF CCP AND TWO COMMERCIAL FREIGHT HAULERS

	CCP	Company A	Company B
• Type of Goods Moved	All classes of Supply (less ammo)	Household	General Cargo
• Area Serviced	CONUS/USAREUR	Worldwide	Washington, Maryland Virginia, North Carolina
• Consolidation of Shipments	Yes	Yes	Yes
• Number of Shipment/Families		20-25/Day	300-350/Day
• Advanced Notice of Material Shipped to Warehouse	No	Yes	No
• Warehouse Hold Time	0-7	Varies	0-1 Day
• Number of Vans (Inbound and Outbound)	50/Day	Peak Season 30/Day	12-14/Day
• Palletized Loads	Yes	Yes	No
• Computerized Inventory	Yes	No	No
• Number of Employees	300	Off season 6-7 Peak season 13-15	30
• Pilferage		Minimal but increasing	Minimal

The movement of a family's household goods overseas begins with a visit of an estimator who identifies all items. After the contract is signed, each item is tagged, packed and moved to the warehouse where it is generally offloaded to be consolidated with other goods for the same approximate destination. Occasionally household goods from two or three families are sequentially loaded in the van for shipment.

Two procedures are used:

1. During the peak season for incountry shipments, household goods are separated by family by the use of bedsprings and mattresses. There is little or no delay moving the goods during the peak season. If a shipment comes to Company A for local distribution, they are notified in advance. Advanced notice is also given for any overseas move. A jacket, filed by name, is set up for each move. The jacket contains all of the information made available to the company. This information includes expected arrival date, name, lot, shipment information, warehouse location, number of pallets, and other containers (rugs are packed in separate containers). Again, this is a manual system.

2. Oversea shipments usually require storage of goods. They are loaded in boxes with rugs stored in special containers. They use 28 different size boxes for storing the goods. The large furniture boxes are stored 5 high. Company A maintains 3 million feet of floor space for packing and storage. A family's goods may be stored in three or four locations. This information is stored in the family jacket and is used by the loader to locate material for containerization.

Pilferage at Company A has been minimal but has been increasing lately. We were told "If this trend continues, we intend to hire private policemen to patrol the warehouse."

COMPANY B

This company provides service between Washington - Richmond, Norfolk, Charlotte, Greensboro, Fayetteville, Raleigh and other cities in Eastern Virginia and North Carolina. The company ships and receives trailer loads to the above cities for local distribution.

They handle 250-300 shipments or 12-14 trailers/day, about half inbound. Shipments are consolidated to some degree in the warehouse. The system for identifying material in the warehouse is totally manual. Shipment warehouse location is recorded on the bill of lading. This is the only information the loader has to work with. Ninety percent of material is in and out of the warehouse the same day.

Pilferage is minimal and according to their spokesman is strictly an internal problem. They place emphasis on the fact that their employees are all honest hardworking people. Each new employee is thoroughly screened before he is hired.

Generally no advanced notice of shipments are received. However, on those occasions when valuable merchandise is on board, they do receive advanced shipment information. Shipments are unloaded and loaded without delay. In order to move 12-14 van loads of relatively small shipments, a fairly effective system must exist.